

# PUBLIC HEALTH REPORTS

*In this issue*



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
Public Health Service



Hearing Loss from Industrial **NOISE**

see overleaf



# PUBLIC HEALTH REPORTS

Published since 1878

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# Electronics and Hearing

A patient at the Audiology and Speech Correction Center, Walter Reed Army Hospital, is shown being tested for loss of hearing (frontispiece). The instrument pictured is a pure tone audiometer.

The modern audiometer owes its development to the phonograph, to the radio, to the telephone, and more recently, to advances in the field of electronics. The audiometer is a high-precision instrument, in which the many component parts are specifically constructed. Designed to reveal accurate information concerning the acuity of hearing, its success depends on the skill and the training of the technician who operates it.

Standard audiometers are calibrated in decibels, to correspond to the threshold of normal human hearing at each frequency. A decibel is one-tenth of a bel, the original unit of loudness. The word "bel" is appropriately derived from the name of the inventor of the telephone, Alexander Graham Bell. (What Price Decibels? appears on p. 953 of this issue of *Public Health Reports*.)

Generally speaking, two types of sound stimuli are commonly used in the testing of hearing: speech and pure tones. The traditional speech audiometer was essentially a phonograph with several pairs of earphones instead of a loud speaker. The recording employed "fading numbers." Since a group of individuals could be tested at one time, this technique was used primarily for screening. Introduced by the Western Electric Company in 1926, the speech audiometer is widely used today in schools, where it is desirable to detect hearing losses at an early age. (See Dahl, *Public School Audiometry: Principles and Methods*.)

Currently, the speech audiometer employs two types of selected words. One group of words (spondees) is used to determine acuity of hearing. The second group is used to determine the subject's ability to understand speech.

The pure tone audiometer may be either of the discrete (fixed) frequency type or the sweep (continuous) type. The pure tone audiometer uses "funny buzzing or whistling sounds" for auditory stimulation. Although it was originally developed for use in individual testing, recent adaptations have made it possible to employ the pure tone audiometer as a "group" or "screening" audiometer.

Since the speech audiometer tests ability to perceive speech, it is concerned principally with the

middle range of frequencies. On the other hand, the pure tone audiometer tests hearing acuity over a wide frequency range. Hence, slight losses of hearing, particularly in the high tone range, may not be picked up by the speech audiometer but will show up on the pure tone audiogram.

For the most part, modern audiometers are replacing the older and simpler "whisper" and "watch tick" tests in clinical examinations. Tuning fork tests, although relatively obsolete in measuring acuity of hearing, are still widely used by otologists as an aid in pathological diagnosis.

The search for more accurate testing methods turned to electrical devices in the late 19th century. Bunch in his *Clinical Audiometry* and in the *History of the Development of the Audiometer* has recorded the history of the various types of apparatus which replaced the tuning fork for measurement of acuity of hearing.

Early models were called variously the "acoumeter," the "electric acoumeter," the "sonometer," and the "induction coil audiometer." These inventions used a tuning fork or a buzzer as a vibration source to activate an electric circuit.

Guttmann in 1921 produced the first vacuum tube audiometer in America. Fowler and Wegel presented a model in 1922 which used storage batteries. The Western Electric Company in 1936 eliminated the battery operation and produced the first audiometer to incorporate a dynamic or moving coil type receiver. In the Maico audiometer introduced in 1936, for the first time an electrical circuit automatically followed the threshold of the normal human ear, making possible the "sweep check" test for normal hearing.

Basically, the modern pure tone type audiometer is a combined transducer and audio-oscillator. It has four essential parts: an electric power supply; a generator for producing an oscillating electric current; a series of resistances for regulating this current; and a telephone receiver—or loud speaker unit—for transforming the oscillating current into sound energy. Batteries are still used in certain portable models. Vacuum tubes are employed in an oscillating circuit to generate tones of different frequencies through the audible range.

Frontispiece photograph courtesy of Armed Forces Institute of Pathology.

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## *Published concurrently with this issue:*

PUBLIC HEALTH MONOGRAPH NO. 22 . . . The Bethesda-Ballerup  
group of paracolon bacilli.

*Mary G. West and Philip R. Edwards.*

35 pages. A summary and information on availability appear on pages 1012-1013.

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# Agricultural Chemicals and Public Health

By WAYLAND J. HAYES, Jr., M.D., Ph.D.

**P**POTENTIAL HAZARDS as well as obvious benefits to the public health result from the manufacture and use of agricultural chemicals.

Among the hazards are the excessive exposure of workers who manufacture, formulate, or apply the materials; the accidental exposure of children or other irresponsible persons; and the exposure of the general population in the event that residues on food should ever be allowed to approach the toxic level.

However, few accidents occur if instructions for the use of the chemicals are followed and the prescribed precautions are taken.

The public health benefits from the use of agricultural chemicals should always be kept in mind in considering the potential hazards involved in the use of these materials. These benefits include improved nutrition and shelter, which result from increased production of food and fiber. Furthermore, some of the so-called agricultural chemicals have fostered health through the control of malaria and other vector-borne diseases (1). Certain fertile areas, notably the Pontine Marshes in Italy, which once were practically uninhabitable because of malaria, now support healthy farm families and a thriving agriculture. In many other areas where farming has been carried on for cen-

turies, the health of the farmers has been improved since the use of insecticides (2).

## Toxicology of Agricultural Chemicals

The results of using cottonfield insecticides in the Mississippi Delta were investigated by Fowler (3) to determine whether the large-scale use of the newer insecticides presented a toxic hazard to the population of that region. The study area included one small city where questions similar to those raised by Biskind (4-7), Biskind and Bieber (8), Merkin (9), and Scott (10) had been asked by one physician. It was suggested that insecticides might be at least the contributing cause of fungus infection, hay fever, asthma, sinusitis, gastrointestinal upsets, dehydration, alkalosis, malnutrition, pneumonitis, cancer, poliomyelitis, arteriosclerosis, heart disease, and insanity.

All physicians in the study area were urged through their medical societies to report cases of suspected insecticide poisoning. Other groups, including hospital staffs, county agricultural agents, and civic clubs, were approached for the same purpose. As was anticipated, a few cases of acute poisoning by parathion and several chlorinated hydrocarbon insecticides were reported, and a few others were uncovered by Fowler in an epidemiological survey of 83 farm laborers and a survey of 639 unselected persons living on a large plantation. The cases of poisoning were all caused by excessive exposure to the insecticides and were frequently associated with gross carelessness on the part of workers.

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*Dr. Hayes is chief of the Toxicology Section, Technical Development Laboratories, Communicable Disease Center, Public Health Service. This paper was presented at the Western Cotton Production Conference in Phoenix, Ariz., April 13-14, 1954.*

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In addition to direct clinical studies, Fowler reviewed school attendance records, mortality records of the delta and of the State as a whole, and morbidity records of a plantation hospital. He also sought the expert judgment of county health officers. He compared the incidence of disease in these areas during the periods before and after the introduction of the newer agricultural chemicals. He also compared the incidence of disease in the regions of the State of Mississippi where insecticides are little used with the disease incidence in the delta, where cotton culture necessitates the extensive use of agricultural chemicals. In all of the studies, no evidence could be found that pesticides were the direct or indirect cause of any chronic disease or a contributing factor in diseases generally recognized as having other etiologies.

In Washington State, although no cotton is raised, many of the problems faced by orchardists around Wenatchee are similar to the problems faced by cotton farmers in places where the fields are near many residences. Agricultural chemicals must be used extensively in order to produce marketable apples and cotton, and there are many situations in which agricultural lands adjoin the suburbs of a town.

Sumerford and his colleagues (11) studied the cholinesterase response and symptomatology from exposure to organic phosphorus insecticides in the Wenatchee district. Emphasis was placed on parathion and tetraethylpyrophosphate because preliminary evidence indicated that these compounds were frequently the cause of illness among workers who used them. However, DDT was usually included in the formulation with these compounds. The amount of DDT used was considerably greater than the amount of organic phosphorus insecticides (12) employed in spraying fruit trees, and the clinical studies gave an opportunity to detect injury from DDT if such injury existed.

The persons studied were divided into eight groups. Three groups (mixing-plant personnel, commercial applicators, and part-time applicators) had extensive exposure. Two other groups had definite, although often minimal and irregular, exposure. A sixth group was made up of residents who lived in or near orchards but had no known occupational contact with insecticides; actually, most of them lived in

orchards with trees on two or three sides of the house. A seventh group was composed of persons who lived more than 500 feet from orchards and had no occupational contact with insecticides. The eighth group included persons living completely outside of the fruit-growing areas.

The average cholinesterase values for groups of persons known to have definite and consistent exposure to insecticides showed significant reduction during the period of contact. No significant reduction in cholinesterase values was found for the groups who made little or no use of the compounds. Although extensive day-to-day exposure was regularly associated with reduced blood cholinesterase, the only fatal and near-fatal cases found were associated not with long-standing use but with brief, massive exposure.

Although a considerable number of mild illnesses caused by organic phosphorus insecticides were found, it is important that even these mild illnesses followed extensive occupational use of insecticides. Further study by investigators at the Wenatchee Field Station has confirmed that persons who live near orchards do not get enough incidental exposure to cause illness. Moreover, the slight illnesses which workers did get as the result of over-exposure were not capricious; they resembled severe poisoning in every way except that they were briefer and milder. Thus, the findings of Sumerford and his colleagues (11) confirm the findings of Fowler (3).

#### Classification of Hazards

Hazards associated with agricultural chemicals may be classified as follows:

1. Hazards of manufacture or formulation.
2. Hazards of mixing or application.
3. Hazards to persons not directly associated with the chemicals.
  - a. Children and irresponsible adults.
  - b. Persons whose food is contaminated by residues of the chemicals.
  - c. Persons exposed incidentally.

Fowler (3), in his study in a cotton-growing area, encountered accidents involving mixing and application of insecticides and two cases of



U. S. Department of Agriculture photograph.

mild poisoning associated with the direct application of parathion to a house.

Sumerford and his colleagues (11), working in another area where insecticides are used extensively, found cases of poisoning in all three classifications, specifically, in formulators, applicators, and children who accidentally ingested insecticides.

It should not be supposed that these studies indicate any basically new development. Poisoning in all of these classifications has long been known for the older pesticides. Each chemical carries its own peculiar danger. Both acute and chronic lead poisoning are well-recognized clinical entities. Chronic lead poisoning, either mild or severe, is less frequent than in the past. However, lead poisoning has been reported (13) since the introduction of the newer insecticides, and whenever lead is used it presents a constant danger. Pyrethrum is in a completely different class so far as toxicity and hazard are concerned, but to emphasize that no material is safe under all conditions, it need only be recalled that pyrethrum has been the cause of anaphylactic reactions.

Compared with the older materials, the safety record of the newer agricultural chemicals is good (14). However, human cases are on record of essentially uncomplicated, acute poisoning by the following newer agricultural chemicals: chlorinated hydrocarbon insecticides—aldrin, chlordan, DDT, lindane, and toxaphene; organic phosphorus insecticides—demeton (Systox), Isopetox, paraoxon, parathion, and tetraethylpyrophosphate; and rodenticides—sodium



U. S. Department of Agriculture photograph.

fluoroacetate (1080), and warfarin. Moreover, the heavy metals may be as dangerous when used for new purposes as they were for old purposes. We have records of poisoning by arsenicals used as herbicides and by mercurials used for fungicidal seed treatments.

Accurate diagnosis of poisoning by newer agricultural chemicals has been made possible by a study of human cases. Obviously, severe poisoning is more easily diagnosed than mild involvement, but except in very specialized situations, diagnosis presents no problem in industry and agriculture or among children who accidentally ingest pesticides. In these instances, the problem, although relatively small, is clearly recognized. Steps to reduce it to a minimum are in order.

Greater emphasis needs to be given to the importance of careful reading of labels. The labels, which are subject to State and Federal control, are the product of careful thought. Accidents with pesticides which do not involve a violation of the instructions and precautions on the label are extremely rare. However, the mere reading of labels is not enough. Each agricultural laborer must be made to understand the reason for precautions in handling insecticides. Proper training may present very real difficulty when laborers are illiterate or when there is a language barrier between them and their supervisors. However, adequate training is the moral responsibility of the employer and the foreman. Such training will be rewarded by fewer accidents and less economic loss.

Recent studies in the Wenatchee, Wash., area



(15) indicate that the potential hazard of parathion to spray personnel is greater by the dermal than by the respiratory route. This finding provides a stimulus for more widespread use of protective clothing, but it does not in any way lessen the need for the use of respirators by persons engaged in parathion application. Particulate matter generally is irritating to the respiratory tract, and this alone is adequate reason for wearing a respirator during mixing operations and in other situations involving a high dust concentration.

#### *Accidents to Children*

It is easy to say that potentially dangerous materials, whether aspirin or rat poison, should be kept out of the way of children, but to accomplish this requires continued education and constant attention. In many areas, more children are poisoned by kerosene than by any other single material, and additional cases of poisoning are caused by solvents in paints and polishes. As a class, drugs cause more poisoning, both fatal and nonfatal, in the household than other chemicals, the number being about equal to the number of cases involving all other kinds of chemicals common in the household (16). The fact that pesticides as a group cause fewer household accidents than some other materials offers little comfort. The record shows that in most instances in which children have been poisoned by pesticides (lindane, parathion, tetraethylpyrophosphate, sodium monofluoroacetate) the tragedy involved a child of the person who owned the compound.

Over and above the personal tragedy, poisoning in children is interrelated with other problems involving hazards to third persons. Once an accident has occurred, the injury to public relations has been done. Recently, two children were killed by ingesting tetraethylpyrophosphate (TEPP). As a direct result of their deaths, the Technical Development Laboratories at the Communicable Disease Center has received correspondence inquiring why the use of such a poisonous material as TEPP is permitted. It is unreasonable to expect the general public to know that this particular chemical hydrolyzes rapidly after it has been applied to fruit trees and that when it is used properly it presents no residue problems. Furthermore,

most organic phosphorus insecticides do not hydrolyze so rapidly, and under practical conditions a few of them remain active for months.

The potential hazard of residues of chemicals in foods has little relation to food products obtained from cotton. It is true that cottonseed oil is extensively used as food and that cottonseed meal is used as feed for livestock. However, the residues of most agricultural chemicals remain external on the plant, and the systemic organic phosphorus insecticides have been proved not to be a practical problem so far as cottonseed is concerned.

#### *Incidental Exposure*

The potential hazards from incidental exposure to pesticides require special consideration. By incidental exposure is meant any exposure which is neither voluntary nor strictly accidental. Thus, incidental to treating a crop, some pesticides may fall in neighboring fields or suburbs without there being any intent to treat those areas and without there being any accident in the usual sense.

Evidence has been presented by Fowler (3), Sumerford and his associates (11), Barnes (17), and others that under ordinary conditions persons exposed incidentally to pesticides do not contact enough of the materials to cause any injury. However, complaints continue to be heard from certain areas. These complaints show a striking variation from one locality to another, and they appear to bear no strict relationship to the amount of pesticides used in the area or, in fact, whether pesticides are used at all.

One community reached near hysteria largely because it was suspected that the deaths of two infants were caused by incidental exposure to organic phosphorus insecticides. Spraying and dusting of trees had been done in the neighborhood and the odor of insecticides was evident. Epidemiological and clinical studies by the Public Health Service failed to show evidence that incidental exposure was the cause of disease. Alarm was dispelled, although the study did reveal cases of poisoning associated with occupational exposure, and investigation was made of several cases in which children swallowed poison with fatal or near-fatal results (18).





Soil Conservation Service photograph.

In two other instances, complaints apparently could be traced to a single person in each community. A study in one community and a public explanation in the other served to reduce the complaints, if not to eliminate them completely. However, an investigation or a public statement will not solve each local problem. In one State, although complaints are less frequent, they have continued after a joint investigation of the use of pesticides by the Public Health Service and the State health department.

It is doubtful if any single reason for success or any single reason for failure to reduce these complaints can be found. For several years, the natural tendency to blame certain illnesses on pesticides has been aggravated by articles in magazines and newspapers, which have failed to recognize the fact that, in large populations, poisoning can be expected to appear most quickly, most frequently, most diversely, and most severely in those persons most extensively exposed to these compounds. The factory workers and farmers who come in contact with chemicals constitute large populations, and it is significant that the cases of poisoning which have occurred were almost all acute and were all the result of definite exposure.

The varied claims of injury from incidental exposure to agricultural chemicals present a problem which can be met chiefly by correct diagnosis of each case. The fact that the studies made so far have failed to reveal injury from incidental exposure to these chemicals does not

necessarily indicate that injury would not be revealed under different conditions. In any event, careful diagnosis of each case of suspected insecticide poisoning and a reasonable regard for the principles of epidemiology remain a crucial responsibility of every physician, whether he be in private practice or in the practice of public health.

### Community Approach

From the community standpoint, there is a mature and an immature approach to the use of agricultural chemicals. Maturity may be measured by the degree to which citizens are aware of the different factors influencing the community and the degree to which they cooperate for the mutual good. In the mature, basically agricultural community, the necessity for using agricultural chemicals is accepted, as is the potential danger which some of these materials bring to those who use them. Partly because this problem of hazard to the worker has been met forthrightly, the safety record is good. Each grower takes direct, personal responsibility for the chemicals to be used and the amount, method, and timing of their application. Neighbors are advised when insecticides are to be applied and recognize the necessity for their use.

### REFERENCES

- (1) Hayes, W. J., Jr., and Simmons, S. W.: Benefits and hazards of insecticides to public health. *Advances in Chemistry Series*, No. 1: 56-60 (1953).
- (2) Simmons, S. W., and Upholt, W. M.: Disease control with insecticides. *Bull. World Health Organization* 3: 535-556 (1951).
- (3) Fowler, R. E. L.: Insecticide toxicology. Manifestations of cottonfield insecticides in the Mississippi Delta. *Agri. and Food Chem.* 1: 469-473 (1953).
- (4) Biskind, M. S.: DDT poisoning and X-disease in cattle. *J. Am. Vet. Med. A.* 114: 20 (1949).
- (5) Biskind, M. S.: DDT poisoning a serious public health hazard. *Am. J. Digest. Dis.* 16: 73 (1949).
- (6) Biskind, M. S.: DDT poisoning and the elusive "virus X": A new cause for gastro-enteritis. *Am. J. Digest. Dis.* 16: 79-84 (1949).
- (7) Biskind, M. S.: Public health aspects of the new insecticides. *Am. J. Digest. Dis.* 20: 331-341 (1953).

- (8) Biskind, M. S., and Bieber, I.: DDT poisoning—a new syndrome with neuropsychiatric manifestations. *Am. J. Psychotherapy* 3: 261-270 (1949).
- (9) Merkin, S.: Warning: Poison in milk! *Nat. Police Gaz.* 159: 8-9 (1954).
- (10) Scott, A. E.: Health foods doorway to death. *Sir* 11: 44-45, 62-64 (May 1954).
- (11) Sumerford, W. T., Hayes, W. J., Jr., Johnston, J. M., Walker, K., and Spillane, J.: Cholinesterase response and symptomatology from exposure to organic phosphorus insecticides. *A. M. A. Arch. Indust. Hyg. and Occup. Med.* 7: 383-398 (1953).
- (12) Batchelor, G. S.: Survey of insecticide spray practices used in the fruit orchards of north central Washington. *A. M. A. Arch. Indust. Hyg. and Occup. Med.* 7: 399-401 (1953).
- (13) Farner, L. M., Yaffe, C. D., Scott, N., and Adley, F. E.: The hazards associated with the use of lead arsenate in apple orchards. *J. Ind. Hyg. & Toxicol.* 31: 162-168 (1949).
- (14) Simmons, S. W., and Hayes, W. J., Jr.: Relative toxicity of insecticides. *Soap and San. Chem.* 27: 148-150 (1951).
- (15) Batchelor, G. S., and Walker, K.: Health hazards involved in the use of parathion in fruit orchards of north central Washington. Presented at meeting of the Entomological Society of America, December 7-10, 1953.
- (16) Hayes, W. J., Jr.: Hazards in the use of insecticides. *Proc. 39th mid-year meeting Chemical Specialties Association.* Pp. 95-97, 1953.
- (17) Barnes, J. M.: Toxic hazards of certain pesticides to man. *Bull. World Health Organization* 8: 419 (1953). Reprinted: *World Health Organization Monograph Series No. 16.*
- (18) Johnston, J. M.: Parathion poisoning in children. *J. Pediatrics* 42: 286-291 (1953).

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## Recipients of Stipends for Training In Public Health Nursing

By RENA HAIG, R.N., M.A., CHRISTINE MACKENZIE, R.N., M.A.,  
and MARY ELIZABETH LAUGHLIN, M.S.

**I**N RECOGNITION of the fact that operation of effective public health programs depends largely on the availability of adequately trained personnel, the Social Security Act passed by the Congress in 1935 provided that a part of the funds allocated to the States might be used for the training of personnel for employment in State and local health agencies. When Social Security Act funds were made available to California in 1936, the California State Department of Public Health began providing stipends for such training. In addition, a portion of the funds appropriated by the California State Legislature for the expansion of public health services was available for training from October 1, 1947, through June 30, 1950.

Each year since July 1, 1936, the department has allocated funds for the training of nurses for public health and related activities, the total amounting to about \$455,500 by June 30,

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*Miss Haig has been chief of the bureau of public health nursing, California State Department of Public Health, since 1936. Previously, she was with the American Red Cross. Miss Mackenzie has been assistant chief of the bureau since 1945 and was formerly assistant professor of public health nursing at the University of California School of Nursing. Mrs. Laughlin, engaged in statistical work since 1940, has been public health analyst with the California public health department's bureau of records and statistics since 1952.*

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1952. To determine the results of this training program, a study has been made of the service given by nurses granted stipends in return for the money invested in their preparation.

### Administration of the Program

For a number of years a lump sum was set up in the health department budget for training purposes, and amounts were allocated to each bureau according to its estimated needs. Each bureau selected for training the number of candidates who could be granted stipends from the amount allocated.

In 1947 a coordinator of training was appointed, and a department advisory board on training, made up of the chiefs of divisions and bureaus concerned with the recruitment of personnel, was created. The board assists the coordinator in the determination of policies and procedures relating to training and reviews and makes recommendations on the proposed training budget.

### Number of Stipends Granted

During the 16-year period, 372 stipends were granted to 317 graduate nurses and 28 senior cadet nursing students. The number of stipends granted each fiscal year, by type of training, is shown in table 1. Of the graduate nurses, 294 received stipends for one type of training, 19 for two, and 4 for three, making a total of 344 stipends granted to this group. The senior cadets were granted stipends during World War II to enable them to work in local health

**Table 1. Number of stipends granted for the training of nurses, according to type of training, California, fiscal years July 1, 1936-June 30, 1952**

Type of training	Total	1936-37	1937-38	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52
Total	372	9	4	7	12	29	22	13	7	21	43	23	42	42	36	31	31
Basic public health nursing	210	9	3	7	7	25	17	7	2	7	18	14	25	19	19	13	18
Supervision and administration in public health nursing	39				1		3	2	2	5	2	1	4	6	5	4	4
Industrial nursing	5						1	2			1	1					
Maternal health	<sup>1</sup> 11				1	1					1	1	5	1			1
Mental health	1											1					
Orthopedics	5		1		1	1			1				1				
Pediatrics	2													1			
Tuberculosis	<sup>2</sup> 7								1	1	1	2		2			
Venereal disease	8				2	2	1	2	1								
Care of premature infants	<sup>3</sup> 30											3	5	8	6	7	1
Child development	<sup>3</sup> 19												2	5	5	3	4
Epidemiology	<sup>3</sup> 7															4	3
Senior cadets	28									8	20						

<sup>1</sup> 6 for nonaccredited courses.

<sup>2</sup> 1 for nonaccredited course.

<sup>3</sup> All for nonaccredited courses.

departments for the last 6 months of their nursing school course. Additional stipends were given to 7 of the senior cadets, after they obtained their registered nurse licenses, for training in public health nursing.

### Basic Public Health Nursing

Of the 210 nurses trained in basic public health nursing, 63, or 30 percent, were recruited by local health departments, and 147, or 70 percent, by the State department of public health. Seventy-one, or two-thirds of the trainees, were new to public health, and the remainder had had experience in the field. The length of this experience varied from 1 to 9 years.

When Social Security Act funds first became available, local health officers were given the opportunity to recommend for training in basic public health nursing members of their nursing staffs who had not completed the university program of study. Of the 12 nurses to whom stipends were granted during the fiscal years 1936-37 and 1937-38, 10 were employees of local agencies and were recommended by health officers. In 1938, it became apparent that additional nurses on the staffs of local health departments were not able, for various reasons, to take advantage of the opportunity to obtain or complete university preparation. Consideration

was then given to applications for stipends from public health nursing students at the University of California in Berkeley.

Because of the limited funds available during the fiscal years 1938-39 and 1939-40, stipends were granted only for the semester of field training to university students who had completed their academic work. As public health programs in the State and local health departments were expanded, with the assistance of Federal funds, the demand for public health nurses increased. To help meet this need, additional funds for training were made available in July 1940. For the next 5 fiscal years, stipends were granted to nurses for 2 of the 3 semesters required to complete the public health nursing program of study. Thereafter, because of increased costs of living, stipends were provided for the entire period of study up to 12 months. The length of time and the type of instruction for which stipends were granted are shown in table 2.

As a result of demands of the military services for nurses, the number of students enrolled in university programs of study in public health nursing dropped sharply during the 3-year period, 1942-45, and there was a marked decrease in the number of stipends requested and granted as compared with the preceding 2 years (table 1). In order to meet the demand for



qualified public health nurses, local health departments were encouraged to recruit and recommend for training nurses whom they wished to have join their staffs when their public health training was completed. In succeeding years, health departments continued to assist in recruiting trainees for public health nursing.

Factors considered in the selection of nurses for basic public health nursing preparation were personality, adaptability, availability and willingness to work in areas where they were needed, family responsibilities, interest in public health nursing, academic and professional records, age, and physical and mental fitness.

At the time they began their study in public health nursing, 72 percent of the 210 trainees were 20 through 34 years of age, and 28 percent were 35 through 54 years of age. Following is the number of trainees in each 5-year age group:

Age (years)	Number of trainees
20-24	31
25-29	73
30-34	47
35-39	36
40-44	19
45-49	2
50-54	2
Total	210

#### Administration and Supervision

Recognizing that the quality of nursing service in an agency is directly related to the amount and quality of supervision available, the State department of public health granted stipends for study in administration and supervision in

**Table 2. Number of stipends granted in basic public health nursing, according to type of instruction**

Type of instruction	Total	Length of training in months		
		3-5	6-8	9-12
Total	210	74	55	81
Academic instruction only	34	18	13	3
Field instruction only	56	56	0	0
Both academic and field instruction	120	0	42	78

public health nursing during 12 of the 16 years. Of the 39 stipends granted for this purpose, 11 went to nurses already on the staff of the State department of public health or to nurses preparing for positions with the department. Stipends were granted to 21 nurses recommended by local health departments and to 7 selected by the State department of public health to equip them for supervisory positions in local health departments.

#### Special Fields

With the development and strengthening of such health programs as venereal disease control, crippled children's services, maternal and child health, tuberculosis, industrial health, and mental health, the need for experienced public health nurses with training in these special fields became apparent. Since qualified nurses were not available, it was necessary to provide stipends to enable a limited number of carefully selected personnel to obtain advanced training. Of the 32 stipends granted for university preparation in special fields, 19 were allotted to nurses preparing for consultant positions with the State department of public health, 11 went to nurses preparing for work in local health departments, and 2 to hospital supervisors in obstetrical and tuberculosis services.

Stipends were also provided to 63 nurses for training in nonaccredited courses of 6 weeks to 6 months in special fields, including care of premature infants, child development, epidemiology, maternity nursing, and tuberculosis nursing. Only nurses employed and recommended by health departments, hospitals, or schools of nursing were granted stipends for these courses. All the nurses from hospitals and schools of nursing who took courses in child development and epidemiology held positions which involved responsibility for the education of student nurses.

Of the 30 nurses who took the course in the care of premature infants, 26 were employed by hospitals. Since skilled nursing care is recognized as one of the most effective means of reducing the number of infant deaths due to prematurity, administrators of hospitals caring for premature infants were encouraged to recommend nurses for training.

### Availability of Training

Training was available in California in public health nursing during all the 16 years; training in the care of premature infants and in child development was available during 4 years. To obtain preparation in other special fields and in administration and supervision, it was necessary for students to attend institutions outside the State. For these trainees, travel and tuition expenses were included in the stipend.

Of the 210 nurses granted stipends for study in basic public health nursing, 34 elected to attend out-of-state universities. The amount of the stipend granted to these students was the same as that given to nurses who studied at the University of California. Travel and out-of-state tuition, however, were paid by the students.

### Application Procedure

With their applications for stipends, nurses are required to submit satisfactory physical examination and chest X-ray reports and evidence of their eligibility for admission to a university program of study or a nonaccredited course. For applicants other than those employed in,

and recommended by, local health departments or hospitals, references are obtained from their most recent employers or from the directors of the schools of nursing from which they were graduated. An interview is held with each applicant by a member of the staff of the State department of health's bureau of public health nursing. A few exceptions to the latter provision were made for nurses recommended by local agencies.

Since the purpose of providing the training funds is to prepare persons for employment in health departments or related agencies, each trainee is required to sign an agreement stipulating that she will accept employment in a California agency designated by the State department of public health. A trainee assumes the obligation to work in an agency for 1 year when the stipend covers a period of not more than 7 months and for 2 years when the stipend is for 8 through 12 months. The training contract stipulates that if a trainee fails to fulfill the obligation of employment, she will repay the stipend or an appropriate proportion of it within a period of 2 years.

### Expenditures for Training

Department policies in regard to the amount of stipends granted to trainees have been revised from time to time. The costs of living, the need for personnel, and the funds available for training have been the major determining factors. Shown in table 3 is the total expenditure during the 16-year period for each type of training.

When the training program was initiated in 1936, the amount of the stipend granted to nurses was \$100 per month plus the university fees and travel costs. As living costs rose, it became necessary to increase the amount of the monthly allowance. Since 1950 the stipend for trainees in the basic public health nursing program has been 75 percent of the beginning salary paid by the State of California to graduate nurses. Nurses employed by health agencies in positions above the staff level receive stipends of 75 percent of their take-home pay at the time training begins. For short-term, non-accredited courses designed to increase the trainees' competence in their positions rather

**Table 3. Expenditures according to type of training, fiscal years July 1, 1936-June 30, 1952**

Type of training	Number of stipends	Expenditures	
		Amount	Percent <sup>1</sup>
Total .....	372	\$455, 581	100. 0
Basic public health nursing .....	210	252, 998	55. 5
Supervision and administration in public health nursing .....	39	89, 938	19. 7
Industrial nursing .....	5	5, 146	1. 1
Maternal health .....	11	20, 224	4. 4
Mental health .....	1	2, 937	. 6
Orthopedics .....	5	5, 710	1. 3
Pediatrics .....	2	9, 125	2. 0
Tuberculosis .....	7	8, 604	1. 9
Veneral disease .....	8	5, 241	1. 2
Care of premature infants .....	30	18, 419	4. 0
Child development .....	19	12, 645	2. 8
Epidemiology .....	7	6, 089	1. 3
Senior cadets .....	28	18, 505	4. 1

<sup>1</sup> Percentages are given as calculated.

than to prepare them for advancement, the full amount of their take-home pay is granted.

### Placement of Trainees

Of the 210 nurses granted stipends for the basic program of study in public health, 190 were assigned to local health agencies in 41 of the 58 counties of the State. (Twelve are still in training, and 8 either failed to complete the course or did not accept health department positions.)

With a few exceptions, the 63 nurses recruited by local health departments for basic public health training returned to those departments upon completion of the training. In the placement of those not obligated to return to a specific health department, consideration was given to the needs of the various areas of the State and to the ability of agencies to give the nurses the type of experience which would contribute to their professional growth and maintain their interest in remaining in public health. As a rule, the trainees were given the opportunity to apply for employment in several health departments.

Of the 39 nurses to whom stipends were granted for training in administration and supervision, 11 returned to the staff of the State department of public health to serve in administrative or consultant capacities; 27 were appointed as directors or supervisors of nursing in local health departments; and 1 did not return to California.

All 32 nurses granted stipends for accredited training in special fields accepted employment in the State upon completion of their training: 19 in the State department of public health, 11 in local health departments, and 2 in hospitals in maternity and tuberculosis services. All 63 nurses granted stipends for nonaccredited training in special fields returned to the agencies by which they were recommended.

### Fulfillment of Obligation

As of June 30, 1952, obligations had been completed in return for 268 stipends, and 38 obligations were in the process of fulfillment. Fifteen trainees granted stipends during the fiscal year 1951-52 were still in school. Twenty-

**Table 4. Number of nurses who failed to fulfill stipend obligations, according to reason for failure**

Reason for failure to fulfill obligation	Total	No service	3-18 months' service
Total .....	23	8	15
Illness .....	2	1	1
Military service .....	1	1	0
Family responsibilities .....	5	0	1 5
Did not complete program of study .....	6	5	2 1
Unwilling to work where needed .....	4	1 1	3
Unsatisfactory performance .....	5	0	5

<sup>1</sup> 1 trained in supervision. <sup>2</sup> Gave public health service with board of education only.

one nurses who were granted stipends for training in basic public health nursing and 2 for study in supervision failed to fulfill their agreements to work in health departments. The reasons for failure to fulfill obligations are given in table 4.

In only three instances was it necessary to discontinue a stipend at the end of the first semester of training because of unsatisfactory academic work. Two of these students continued at their own expense and satisfactorily completed the university program of study. Four of the nurses who failed to meet their obligations made full or partial repayment of their stipends.

### Length of Service

The length of service given by all the graduate nurses to whom stipends were granted is shown in table 5.

One hundred twenty-six, or 66 percent, of the nurses given stipends for study in basic public health nursing worked in health departments for 2 years or more. After completing their obligation in health department employment, a number of these nurses accepted positions with boards of education or other agencies.

The total amount of service given in public health by the nurses who received stipends for study in basic public health nursing and in supervision and administration is summarized

**Table 5. Length of public health nursing service given in California by graduate nurses who received stipends for training**

Type of training	Total	Years of service															Received stipends for more than one type of training <sup>1</sup>	Still in school
		Less than one	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Basic public health nursing	<sup>2</sup> 210	25	31	36	29	14	19	6	3	9	5	4	2	4	1	1	2	12
Supervision and administration in public health nursing	<sup>3</sup> 39	7	4	5	2	1	2	1	2	1	1			1				11
Accredited training in special fields	32	1	2	1	3	4		2	2	2	3	1	1	1				9
Industrial nursing	5		1		1	1		1										1
Maternal health	5			1	1	1							1					1
Mental health	1				1													
Orthopedics	5					1			1			1		1				1
Pediatrics	2																	2
Tuberculosis	6		1			1			1									3
Veneral disease	8	1						1		2	3							1
Nonaccredited training in special fields	63	10	17	9	12	4	3						1					4
Care of premature infants	30	4	10	5	6	1	2											2
Child development	19	5	3	4	5													2
Epidemiology	7	1	4															2
Maternal health	6					3	1						1					1
Tuberculosis	1				1													

<sup>1</sup> Length of service for these nurses is recorded under the type of training for which they had their first stipend.

<sup>2</sup> 7 gave no public health nursing service.

<sup>3</sup> 1 gave no public health nursing service.

in table 6. The percentage of time they were employed of the total time they could have worked after completing their training is shown. Of the nurses who had stipends for study in basic public health nursing, 118, or 59 percent, were employed in public health activities 75 to 100 percent of the time they could have worked. Twenty-seven of the 39 nurses who obtained preparation for supervision and

administration worked 75 to 100 percent of the available time.

Since one of the factors considered in selecting applicants for stipends for the basic program of study in public health nursing was age, an analysis was made of the relationship of age to length of service. The data for the 198 nurses who had completed their training (including 6 who dropped out at the end of 1

**Table 6. Number and percentage of trainees in basic public health nursing and supervision and administration who have spent specified percentages of time in public health work in California**

Percentage of total working time <sup>1</sup> devoted to public health nursing service	Basic public health nursing trainees				Supervision and administration trainees	
	Work in health departments only		Work in all public health agencies			
	Number	Percent	Number	Percent	Number	Percent
Total	198	100	198	100	39	( <sup>2</sup> )
0	8	4	7	4	1	( <sup>2</sup> )
1-24	35	18	28	14	3	( <sup>2</sup> )
25-49	30	15	20	10	2	( <sup>2</sup> )
50-74	32	16	25	13	6	( <sup>2</sup> )
75-100	93	47	118	59	27	( <sup>2</sup> )

<sup>1</sup> Working time from completion of training through June 30, 1952.

<sup>2</sup> Percentage not calculated.



term) presented in table 7 show that 52 percent of those under 30 years of age had worked 75 percent of the time it was possible for them to have worked. Sixty-six percent of those 30 years old and over had worked the same percentage of time.

### Employment Status

Of the 302 graduate nurses granted stipends who had completed their training, 75 percent were known to be employed in public health or hospital nursing on June 30, 1952. The following tabulation shows the employment status at the close of the study of all graduate nurses granted stipends:

<i>Employment status</i>	<i>Number of trainees</i>
Employed in nursing in California-----	218
State department of public health-----	12
Local health departments-----	143
Boards of education-----	34
Hospitals-----	26
Schools of nursing-----	2
Private agency-----	1
Employed in nursing outside California-----	9
Public health agencies-----	8
School of nursing-----	1
Employed in fields other than nursing-----	5
Not employed-----	55
In school-----	15
No information-----	15
Total-----	317

Of the 190 who completed their basic public health nursing preparation on stipends and accepted staff positions in health departments, 24 advanced to positions of greater responsibility. Thirteen of the number who later became supervisors, directors, or consultants did so after obtaining advanced preparation. Nine of this group were granted stipends for their advanced work.

A commonly accepted ratio of supervisors to staff public health nurses is 1 to 8 or 10. The ratio of advancement from staff to supervisory positions among the trainees was 1 to 8.

### Summary and Conclusions

During the 16-year period covered by this study, 372 stipends were granted to 317 graduate nurses and 28 senior cadet nursing students.

Of the 210 nurses who were assisted in preparing for staff positions, 30 percent were recruited by local health departments and 70 percent by the State department of public health. One-third had had experience in public health of from 1 to 9 years prior to taking their university preparation. Factors considered in evaluating applicants for stipends included physical and mental health, age, availability to work where needed, and personality.

With few exceptions the nurses recommended by local health departments returned to those agencies to work. In the placement of public health nurses not obligated to return to specific health departments, consideration was given to the needs of the various areas of the State, and efforts were made to place the trainees in

**Table 7. Number of trainees in basic public health nursing who have spent specified percentages of time in public health work in California, by age**

Percentage of total working time <sup>1</sup> spent in public health nursing	Total	Age in years						
		20-24	25-29	30-34	35-39	40-44	45-49	50 and over
Total-----	198	29	70	46	33	16	2	2
0-----	7	3	2	1	-----	1	-----	-----
1-24-----	28	4	12	9	3	-----	-----	-----
25-49-----	20	2	10	7	1	-----	-----	-----
50-74-----	25	3	11	5	4	2	-----	-----
75-100-----	118	17	35	24	25	13	2	2

<sup>1</sup> Working time from completion of training through June 30, 1952.

as many health departments as possible. One hundred and ninety public health nurses were assigned to agencies in 41 counties.

An analysis of the relationship of the age of the nurses at the time they started their university preparation to the length of time they remained in public health work showed that the group 30 years of age and over had a slightly better record than the group under 30.

Of the 39 experienced public health nurses granted stipends for training in administration or supervision, 27 were later employed in local health departments as directors or supervisors of public health nursing. Eleven were prepared for positions with the State department of public health.

To help meet the need for personnel in developing programs in special fields, stipends were granted to 32 nurses for advanced university preparation. In addition, 63 stipends were provided for short-term nonaccredited courses in special fields.

In return for the 344 stipends granted to graduate nurses, commitments to work for specified periods of time were met or were in the process of fulfillment in all but 23 instances. As of June 30, 1952, 75 percent of the 302 grad-

uate nurses who had completed their training were known to be employed in public health or hospital nursing.

Of the 190 nurses who were given stipends for training for staff positions and who had completed their training and accepted positions with health departments, 1 out of every 8 has already advanced to a position of increased responsibility as director, supervisor, or consultant in public health nursing.

On the basis of the facts brought out in this study, the department believes that the money spent for the education of nurses for the public health field has been a very profitable investment. The number of nurses added to the supply of those qualified for public health work and the length of time they have served in public health have been shown. The improvement in the quality of public health nursing service brought about by nurses whose training was made possible through the State program cannot be measured statistically. However, in the judgment of persons familiar with their work, these nurses in the State and local health departments through their leadership are making a major contribution to the improvement of public health nursing service in California.

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## Departmental Announcements

**Charles Irwin Schottland** was sworn in as Commissioner of Social Security August 26, 1954. He succeeds John W. Tramburg who has resumed the position of director of the Wisconsin Department of Public Welfare. At the time of his nomination by the President, Mr. Schottland was director of the California Department of Social Welfare and chairman of the National Council of Public Assistance and Welfare Administrators.

Mr. Schottland this year received the Koshland award as the outstanding social work executive in California. In 1941 he served as assistant to the Chief of the Children's Bureau. From 1942 to 1945 he was on General Eisenhower's staff, in charge of the section dealing with displaced persons. He was decorated by the governments of France, Poland, Czechoslovakia, and Holland for this work. He later served as assistant director of the United Nations Relief and Rehabilitation Administration for Germany.

Mr. Schottland received his bachelor of arts degree from the University of California in 1927.

He attended the New York School and the Graduate School of Social Work in New York City in 1928-29. He received a law degree from the University of Southern California Law School and was admitted to the California bar in 1933.

**James Bradshaw Mintener** was appointed Assistant Secretary for Federal-State Relations in the Department of Health, Education, and Welfare on September 7, 1951. Mr. Mintener succeeds Russell Larmon, who resigned to return to his post at Dartmouth College.

At the time of his appointment, Mr. Mintener was vice president and general counsel of the Pillsbury Flour Mills Company, Minneapolis, Minn. Prior to his association with that firm he practiced law and was an instructor at the Minnesota College of Law.

Mr. Mintener attended Yale and Oxford Universities and the Harvard Law School. He received his LL.B. from the University of Minnesota in 1929.

*Carrying the same warning against the pseudoscientific method that applies to cancer epidemiology, this message is broadened to the whole field of noncommunicable diseases by an epidemiologist who knows the pitfalls.*

## Epidemiology in Noncommunicable Disease

By ALEXANDER G. GILLIAM, M.D., Dr.P.H.

WHENEVER public health interest is newly attracted to a disease, one commonly hears it said "We must do some epidemiology on it." This is a pious idea, and all who class themselves as epidemiologists would concur in it. However, even among epidemiologists there would probably be little agreement on the important details of what constituted "doing some epidemiology" and even less agreement on what one might expect to learn from "doing it." It is not proposed here to attempt to outline a practical blueprint one might follow in doing some epidemiology. It would, however, appear to be useful to organize some ideas as to the stuff of which most present epidemiological evidence in noncommunicable disease is made and discuss some of its potentialities and limitations.

### "Upon the People"

As not a few of us are aware there are probably as many definitions of epidemiology as

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*Dr. Gilliam, chief of the Epidemiology Section of the National Cancer Institute, Public Health Service, presented this paper at the annual meeting of the American Public Health Association, New York City, November 12, 1953. An earlier address made before the Western Branch of the association appeared in the October issue of the American Journal of Public Health, p. 1247.*

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there are people classed as epidemiologists. Except for those definitions that are patently wrong, even as applied to communicable diseases, like the one found in the second edition of Webster's unabridged dictionary, all have as their central idea the study of disease in human populations for that aid which knowledge gained may give in determining factors related to, or governing, disease occurrence. All medical sciences have this objective—determination of etiological factors. Epidemiology, which is derived from Greek roots meaning "upon the people," differs most essentially from other disciplines in that its universe of study is human society or selected segments of it, rather than the individual.

For the purposes of this discussion epidemiology may be divided into two broad branches—descriptive and determinative. Descriptive epidemiology, through studies in human populations, concerns itself with characterizing or describing the kinds of people who acquire or escape disease. Determinative epidemiology tests in human experience inferences drawn from the evidence of descriptive epidemiology or from other bodies of knowledge. Following the working definition just mentioned, descriptive epidemiology enumerates factors related to disease; and determinative epidemiology attempts to define those which govern its occurrence. Though all factors governing disease occurrence are related to it, the converse is not always true, for factors associated with disease do not necessarily govern its occurrence.



Thus, endemic pellagra in southern mill villages was firmly associated with a diet of corn bread, fatback, and blackstrap molasses although this diet was not the direct cause of the disease.

### Measuring Risk

In characterizing the kinds of people who acquire and escape disease, the initial effort of descriptive epidemiology is to measure risk in groups of people with different characteristics. Risk is measured through computation of incidence, which is an expression of the probability that one of a group will develop or die from disease in a period of time. It should not be necessary to define the word "incidence," but it is appropriate to do so since it is so badly misused in the literature of clinical medicine and pathology—the literature which comprises much of present epidemiological evidence in noncommunicable disease. Since data are so often labeled "incidence" when they may not even reflect it and conclusions then drawn which would be valid only if the data did in fact represent it, an agreement on its meaning is more than a question of semantics.

Three elements enter into the computation of incidence: the population at risk; all cases or deaths occurring in the population; and a specified period of time. Incidence is thus the rate of occurrence or diagnosis of disease, or death, per unit of general population during a period of time. In this country, at least, it is becoming most acceptable practice to limit the use of the word to morbidity data—an expression of rate of occurrence or diagnosis of disease. It is still, however, in conformity with good usage to apply the term to death data. Although there is abundant precedent in reputable medical literature for using the word "incidence" in describing data other than those representing probability of occurrence of disease, such misuse is in large part responsible for a great deal of present confusion in epidemiological evidence pertaining to many noncommunicable diseases. It is not infrequent to see the word applied to as many as four totally different kinds of data in the same medical article. Because of this practice, it is necessary to be quite wary every time the word is encountered. cursory examination of presented data will frequently reveal

that they do not represent true incidence, and thus are not measures of risk although the author draws conclusions which would be valid only if they did so in fact.

Descriptive epidemiology employs two general methods in attempting to measure risk to disease in groups of people with different characteristics. These may be called the direct, or population method, and the indirect, or case history method. These methods differ not only in the detailed procedures they employ, but more importantly in the confidence which may be placed in evidence derived through their use.

### *Indirect or Case History Method*

The time-honored but less satisfactory technique in measuring risk is the indirect or case history method. By case history method is not meant the detailed study of a single case although such study has a definite place in some epidemiological investigations. The case history method is here intended to mean the procedure which has as its point of departure records of a group of cases of a disease. It has been employed by astute clinicians and pathologists ever since formal or informal summaries of series of cases have been made. Characteristics of patients are obtained through observation or interview of individuals. Histories obtained are compared with those from a control group of well people or with patients from the same clinical experience who have presumably unrelated disease. Risk to the disease under study is inferred from differences demonstrated between study and control groups.

In the earliest application of case history method, the kinds of patient attributes available for study were those recorded in connection with clinical care. These included such characteristics as age, race, sex, marital status, occupation, family history of disease, place of residence, and others. As associations between such characteristics and a disease were suggested in a small series, or from one locality, similar observations were extended to larger series and to other localities. Associations so derived which offered some plausible explanation for disease causation were then further tested in a larger series for the purpose of getting detailed information on the particular attribute. To obtain a large enough series so



that statistical significance might be attached to associations developed, recourse was generally had to large general hospitals in which a substantial number of patients with the disease might be anticipated. Or, questionnaires for completion were submitted to a number of widely scattered physicians specializing in the disease so that a substantial number of records might be analyzed. While satisfying the need for numbers, these procedures sacrifice the more essential necessity for interview of cases which are truly representative of the disease in general. When, however, great care is taken in selection of patients and controls for interview, the purposeful questionnaire represents the case history method at its best. Some mention will be made later about the security of the evidence derived from it.

There are several other minor modifications of what is here called the case history method. Instead of using a series of cases, as outlined above, to enumerate attributes or history which are associated with a disease, these cases have been used in attempting to reflect incidence of disease in some locality; incidence among some occupational group, or in some race; or as indicators of disease trends. This variant deserves some mention since, in the literature of pathology and of clinical medicine, it is so commonly employed in an effort to measure risk to a large number of noncommunicable diseases. It is regarded as particularly appropriate for diseases which require special skills in their diagnosis: skills that are generally found only in well-staffed hospitals. Since the diagnostic court of last resort is the autopsy table, some regard as valid only that evidence derived through analysis of necropsy series.

In principle this variant consists in taking admissions to a hospital, disease or deaths occurring in some closed population such as employees in an industry, or autopsies performed in a hospital, and computing the percentage that the disease under investigation is of the total. Thus, it is noted in one South African hospital that primary cancer of the liver is found in 90 percent of cancer autopsies among Bantu, while only 1 or 2 percent of cancer found at autopsy among Europeans is at this site. Ergo, the "incidence" of primary cancer of the liver is from 45 to 90 times greater in Bantu

than in Europeans. Or, respiratory cancer comprises 30 percent of all cancer deaths observed in employees of a certain industry, while only about 15 percent of all cancer mortality in United States males is at this site. Ergo, employees of this industry suffer an "incidence" of respiratory cancer which is twice that observed in all males. Or, in General Hospital X, 20 years ago 4 percent of all cancers found at autopsy were charged to carcinoma of the lung while now this site comprises 11 percent of the total. Ergo, the "incidence" of carcinoma of the lung has nearly trebled in 20 years.

Examples of evidence of this type may be found in the literature of all noncommunicable diseases. The authors almost invariably label as incidence the ratio of one disease to the total. Such ratios in fact, however, are relative frequencies and cannot even be assumed to reflect incidence, much less measure it, unless a number of other conditions are satisfied. Unless all illnesses occurring in a definable population are diagnosed in the hospital, or unless they comprise a sample of known composition, relative frequencies computed from hospital data cannot be assumed to reflect incidence of disease in the population the hospital serves. The situation with regard to autopsies is even worse since selective factors, additional to those which bring the patient to the hospital in the first place, operate in determining which fatal case is autopsied. Autopsies in most hospitals thus represent a sample of a sample of an unknown amount of illness occurring in a population of unknown composition. No one has yet devised a practical, uniform way to compute incidence from data of that kind.

The practice of using hospital or autopsy series in an effort to measure risk to a wide variety of diseases, among people possessing greatly different characteristics, stems from the constant search of the epidemiologist for significant differences in risk. If the Bantu do in fact suffer an extraordinarily high risk to primary carcinoma of the liver, then a number of hypotheses are suggested, and there is real hope that further epidemiological research may contribute to a knowledge of the essential causes of this disease. The enormous diversity in race, environment, nutrition, social customs, and a host of other factors available to us in the life

experience of different peoples throughout the world need no emphasis. Utilization of these differences in describing factors related to any disease, however, requires that risk to disease be measured in the groups possessing different characteristics. This cannot be accomplished directly through relative frequencies derived from routine hospital and autopsy experience. To make full epidemiological use of the obvious differences between, say, South African Bantu and American Negroes requires first that a real difference in risk to disease be demonstrated. If some uniform and practical way can be found to accomplish this through use of hospital and autopsy statistics, then the potentialities of the epidemiological method will be greatly enhanced. In spite of the fact that no practical solution is obvious and in spite of the opinion held by many that none is possible, one should not be deterred from seeking a practical way to make such data valid reflectors of risk.

#### *Population or Direct Method*

The population or direct method of measuring risk has as its point of departure a group of people instead of a group of cases of disease. The population under study is generally selected because it is known to possess general or specific characteristics which set it apart from the universe of which it is a part, or because it is different from some other distinct group. Or, an entire population may be divided into those who possess or lack characteristics of interest. Disease occurrence is then measured in the segments with different characteristics. In some instances disease occurrence may be measured in retrospect, but preferably the population is first characterized and subsequent occurrence of disease in the subgroups with different characteristics is measured by means of a study projected into the future.

The bulk of the evidence of descriptive epidemiology which is presently available for non-communicable diseases has been derived through applications of some variant of the case history or population methods of study. For most of these diseases by far the largest proportion of the evidence has been acquired through case history investigation.

#### **Security of Case History Evidence**

The confidence which may be placed in case history evidence obviously varies with the disease under study. It also varies with the characteristic or history under investigation, particularly in relation to the likelihood of its being remembered and divulged with equal accuracy by cases and controls. In addition, the security of case history evidence depends heavily upon selective factors which determine the representativeness of the samples of cases and controls which are interviewed. It is not too difficult to make them representative with regard to such factors as age, race, sex, and residence. Until information is accumulated about all of the important characteristics associated with the disease, however, one is unable to estimate accurately just how representative the sample is. For example, the recently accumulated evidence for an association between cigarette smoking and carcinoma of the lung, at the very least, means, that in future studies of lung cancer, stabilization of smoking habit patterns is just as important as stabilizing such factors as age, race, sex, and residence.

All of these considerations have an important bearing on any estimate of the security of case history evidence, and the three factors mentioned are by no means all which bear on it. It is, therefore, best to accept case history evidence with reserve. In this sense, characteristics of patients enumerated by the case history method should be looked upon as having an initial validity about comparable to that of the clinical impression. The clinical impression is invaluable in providing concrete leads and points of departure for further investigation. It should not be regarded as fact until sufficient replication and direct and indirect verification attest to its consistency.

#### **Associations and Hypotheses**

It should also be remembered that even after an association between some disease and a patient attribute has been fully established, it does not necessarily follow that this attribute is an essential cause of the disease. As mentioned previously it is now known that neither low income nor a diet of corn bread and blackstrap had any direct role in causing pellagra, although

there was a high degree of association between these patient attributes and the disease as it occurred in the southern United States.

Associations, no matter how they are derived, do suggest hypotheses. Hypotheses which can be subjected to further test serve a useful purpose. But until they are adequately tested, no useful purpose can be served by parading them as fact.

In selecting the phrase noncommunicable disease for this discussion, it was not intended to imply that the large body of diseases now regarded as noncommunicable are necessarily so in fact. Impressed as we are with the skill and accomplishments of the microbiologist, we are apt to regard failure to identify some infectious agent as proof of noncommunicability. Communicability, however, is not fundamentally a concept of microbiology. It is a function of behavior of disease in human populations and, as such, is an epidemiological concept. For example, in spite of its microbial origin, it is known that tetanus is not communicable because of the way in which it is distributed in people. While it is highly unlikely that any disease would be seriously regarded as communicable today unless an agent had been identified, it should not be forgotten that the basic evidence for communicability lies not in microbiology but in behavior of disease in human populations.

In considering evidence which might bear on communicability it should also be remembered that infectious diseases vary in both their frank and apparent contagiousness. That chickenpox and measles are "catching" is obvious to laymen. Paralytic poliomyelitis frequently appears less so than an outbreak of broken legs. Brill's disease, while not communicable in the ordinary sense, has now been shown to represent a manifestation of infection acquired many years before—it has a very long latent period, as does leprosy. Clinical manifestations of tuberculous infection depend to some extent on the age at which infection is acquired. Thus, there is enough analogy with known infectious processes to warrant asking if some so-called noncommunicable disease might actually be communicable in spite of absence of obvious evidence for it.

In the literature of cancer there is very little epidemiological evidence that bears on this question in more than a superficial manner. For example, surgeons and gynecologists, who are exposed to many "open" cases, apparently have a lower risk to cancer than other specialists who are not heavily exposed in their practice. On the other hand, there is an abundant literature illustrating familial aggregation of the disease not dissimilar to that found in the older literature of tuberculosis.

It is tempting to argue by analogy with known infectious processes and attempt to explain some of the evidence on the basis of an infectious origin of cancer, but no useful purpose is served by doing so. The present scientific dictum that cancer is not communicable makes good sense and is entirely consistent with evidence now available. It should be recognized, however, that on the basis of present epidemiological evidence this is essentially a dictum. Neither dicta nor voices of authority should overawe or deter us from collecting and examining pertinent epidemiological evidence which may bear on whether many diseases now quite properly regarded as noncommunicable are so in fact.

#### **Refinement in Measurement**

Before closing this discussion there are several other considerations which deserve mention. As all who have attempted epidemiological studies are aware, one of the primary deterrents to effective use of the method is inherent in the difficulties encountered in dividing any general population into those who do and those who don't have the disease under study. This difficulty naturally varies with the disease but in all diseases has two general components. The first part of the difficulty depends upon the ease with which the disease may be accurately diagnosed and the second, on the ease one might expect to have in counting cases once they are clinically identified.

Precision of diagnosis depends in large measure on the kinds and availability of diagnostic skills and techniques necessary for effective identification of disease. If the disease in all of its stages can be accurately diagnosed by the average practitioner on clinical grounds,



then no difficulty is encountered. On the other hand, if specialist-care, hospitalization, laboratory procedure, or autopsy is necessary, then one must expect that a number of cases will go unrecognized. Further, the selective factors leading to the recognition of the few will be generally unknown. Between these extremes, all gradations of difficulty in diagnosis are encountered among the noncommunicable diseases.

The only direct and completely satisfactory solution to the general problem of case identification depends upon the development of inexpensive and objective diagnostic tests which are practical for application to the general population. Although this has been the experience in communicable diseases, extremely useful, epidemiological study did not have to await such tests. The problem may be looked upon as one of refinement in measurement. While one would like to have the diagnostic precision obtained by the autopsy, the diagnosis possible from clinical examination by the average practitioner has important epidemiological uses. All science seeks to measure on an increasingly fine scale. On a relative scale, if the autopsy represents diagnostic measurement to the nearest millimeter, then the death certificate in some areas might record only the nearest mile. While a millimeter scale is desirable, a mile stick is a useful device provided it is clearly understood that it is a mile stick and not a millimeter stick. If so much enthusiasm were not exhibited in the belief that hospital autopsies measure incidence, a way might be found to use necropsies to calibrate the death certificate in the area the hospital serves.

Once cases are identified the problems involved in counting them also vary with disease. For those which produce symptoms of the kind and severity which lead patients to medical care, there are many devices which have been employed in estimating their number and location. In some diseases, however, such as certain types of mental deficiency, the seeking of medical attention is frequently dependent entirely upon social and economic factors and bears little relation to the illness itself. Some may not even be detected in a careful survey because of a tendency of families to hide them. More than

ordinary ingenuity is required in counting cases such as these.

Difficulties attendant upon counting cases of noncommunicable diseases have led many to recommend establishment of case registers. If experience in cancer is any guide this effort is generally unsatisfactory. Case registers for epidemiological purposes require competent statistical design and close technical supervision in their operation. They are also expensive. Of the many cancer registers established in this country there are only two which meet more than very superficial epidemiological needs, although many may serve some other laudable purpose, such as directing attention to particular needs in a service program. As most cancer registers operate in practice, however, the cases recorded are generally as unrepresentative of all existing cases as are those cases which gravitate to some particular hospital.

Some attention is being given the idea of establishing a few selected areas for general morbidity reporting. This deserves further consideration since the expense in terms of technical skills and money is not increased in direct proportion to the number of diseases included. The adequacy of communicable disease reporting has generally been a direct function of the service provided patients and their physicians as a result of the report. Physicians may be expected to cooperate generally with noncommunicable disease reporting if they can be shown that something worthwhile will come of the effort.

Until adequate access can be had to noncommunicable disease as it occurs in definable populations, substitute procedures for estimating their number and characteristics will continue to be employed. Because large general and specialized hospitals provide ready access to competently diagnosed cases, as well as autopsies, the case history method will continue to be applied to them. There is a general tendency of the professional epidemiologist and the biometrician to be scornful of the efforts of the clinician and pathologist in this direction. While a critical attitude is justified, a scornful one contributes nothing constructive. The fact that no practical way seems possible to make this readily available material of more general



epidemiological usefulness merely increases the challenge to those with the technical skills which might contribute to a solution.

At the beginning of this discussion the question was inferred "what might one expect to accomplish in 'doing some epidemiology' in noncommunicable disease?" As far as the past is concerned, epidemiology has made substantial contribution in some. For example, all of the knowledge essential to practical control of both mottled enamel and pellagra was acquired through application of epidemiologi-

cal method. As to the future, descriptive epidemiology alone, as a minimum, should direct attention to those segments of the population in which greatest returns from "control" measures might be expected. Aside from that, one can only say with assurance, that from whatever scientific discipline the clues to etiology of disease eventually come, they will remain unacceptable until they have stood the test of consistency with epidemiological facts—consistency with the facts of occurrence of disease in human populations.

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*A brief discussion of methods and principles that can serve as a guide for studying the present status of air pollution sampling instruments and their application to field problems.*

## Sampling Instruments For Air Pollution Surveys

By **LESLIE SILVERMAN, Sc.D.**

**T**HE SELECTION and use of suitable sampling instruments for appraising atmospheric contamination in industrial areas is becoming an increasingly important problem. In recent years, the attention of the public has been focused on pollution of the atmosphere outside the factory, and incidents, such as that at Donora, Pa., and the oil refinery tragedy at Poza Rica, Mexico, have helped to highlight the need for cleaner city and industrial area environments.

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Because the atmosphere has not been recognized by the public as a carrier of disease, clean air has not received the same attention as a safe drinking water supply. Man can apparently tolerate a significant amount of airborne pollution without interference with his daily activities. In fact, in some instances he deliberately pollutes his own inspired air without immediate significant consequences—through his own smoking.

In the past 2 decades, industrial hygienists have made great strides in developing sampling devices and survey equipment for inplant air contamination. Fundamentally, those instruments can be applied to many atmospheric pollution problems, but there are certain basic differences which should be pointed out. Ordinarily, industrial hygiene sampling as encountered in factory work involves concentrations of contaminants within or near the so-called maximum allowable or hygienic standard concentrations for 8-hour exposure. These concentrations may vary anywhere from 10 to 1,000 or more times the values found in outdoor contaminations. In many cases, odors are a cause for public complaint, and concentrations of these may be as little as one-millionth of the permissible values used for occupational disease control.

Another feature of industrial hygiene sampling besides the higher concentrations which may be encountered is the fact that experienced personnel are usually available for sampling and analysis. Except for a few agencies, this does not obtain for atmospheric pollution problems. The many small city or town groups which are often involved have limited means of obtaining objective data.

This brings us to the fundamental need for simple and direct methods of evaluation for the usual cases of air pollution. Special types of contaminants will require special treatment and expert advice, but certain widely present, common contaminants are subject to measurement by uncomplicated apparatus and procedures.

### **Nature of Airborne Contaminants**

The materials emitted into the atmosphere vary widely in composition, concentration, and size. They come from numerous sources, such as from the combustion of solid, liquid, or gaseous fuels, from industrial processes, from the burning of rubbish, from transportation vehicles, and from many other sources. These airborne contaminants may be created by man or by nature.

In physical nature, these pollutants may be gases or solid or liquid particulate matter. Chemically, they may be inorganic or organic, metallic or nonmetallic, and they may be elements, compounds, or mixtures. They may range in concentration from conditions which obscure sunlight to barely perceptible odors. They vary in size from microscopic to submicroscopic and change in concentration with altitude and distance from various sources. Some pollution is present in the atmosphere in most locations around the globe. Certain contaminants from fires, explosions, or chemical reactions have traveled thousands of miles.

### **Sampling Instruments**

The problem of devising sampling instruments for such a wide variety of materials complicates the control of air pollution to some extent. The problem is ordinarily broken down into handling these contaminants on the basis of their physical state according to whether

they are (a) gases and vapors, or (b) particulate matter—dusts, fumes, smokes, mists. Complete but somewhat arbitrary descriptions of these classifications are given in many sources. The ones most widely used are those described by the author (1).

Whereas smokes may be solid or liquid, and mists are usually liquid, dusts and fumes are usually solids. These two types of particulate matter range in size from molecules to 50 microns or more for dusts. Fumes and smokes exist in the smallest size ranges for particulate matter, usually less than 0.5 micron.

The method of sampling is influenced by the time available and the concentration of the aerosol. Ordinarily, samples for atmospheric pollution studies are divided into three categories:

1. High concentrations (sampling from stacks or process effluents). Gases are measured in percentages by volume; particulate matter in grams per cubic meter.
2. Intermediate concentrations (sampling in the wake of stacks or close to industrial plants). Gases are measured in parts per million; particulate matter in milligrams per cubic meter.
3. Low concentrations (sampling in polluted city atmosphere or at considerable distances from industrial operations). Gases are measured in hundredths of parts per million, or in parts per 100,000,000; particulate matter in micrograms per cubic meter.

The selection of instruments for these conditions is dependent on the range encountered, which is not always easily determined.

Gases and vapors in high concentrations can be collected instantaneously in evacuated flasks or continuously in absorption vessels. With sensitive chemical methods, the use of instantaneous samples may be extended to intermediate concentrations. Continuous absorption is usually preferred since it gives integrated evaluations. Low concentrations require continuous absorption methods and sensitive chemical procedures.

Particulate materials may require one or more of several types of evaluation: gravimetric, surface area, stain, or particle enumeration. In addition, it may be necessary to measure the size of the individual particles.

The collection of particulate samples depends on one or more of the following principles: (a) sedimentation, (b) visual or photometric absorption, (c) inertial and centrifugal force, (d) impingement (impaction and jet condensation), (e) filtration, (f) washing or scrubbing, (g) thermal precipitation or electrostatic precipitation.

Typical methods for particle size evaluation depend on microscopic examination of a sample from the collected material in the instruments incorporating the above principles. Another approach is to use an instrument which separates particulate matter as sampled; so far, only cascading with a series of different-sized impingement nozzles or centrifugal action (conifuge) has been successfully applied for this purpose.

At the present time, there are many instruments available for sampling which incorporate one or more of the above principles. A brief survey of each type is given in the accompanying table, adapted from the author's article (2) and from the Handbook on Air Cleaning (3), which has since been expanded considerably in the Air Pollution Abatement Manual, chapter 6, by Magill (4).

#### Methods and Their Limitations

Basically, all of the methods proposed and used in air pollution sampling surveys have some inherent limitations. The general philosophy with regard to sampling has been to place more emphasis on particulate collection devices than on gas-sampling units. Most gases can be determined with known efficiencies and with limitations only as to the size of sample necessary for analysis. Certain gases, such as ozone and oxides of nitrogen, require special techniques for collection and analysis, but others can be collected and analyzed without difficulty.

The particulate sampling problem has been handled principally by considering the nuisance aspects of pollution as the paramount aspects. With this approach, settled dust is a major item and is determined by settling chambers (dust- or soot-fall cans). Unfortunately, no standard size chamber has been used, and different techniques have been applied such

as using water or other liquids to prevent blow-out, various types of shields and grids, wind-direction louvers, and wind-controlled openings.

Staining or soiling is another major nuisance aspect of air pollution. This has been measured by a variety of devices utilizing either impingement on a white surface or filtration through a filter paper. A number of samplers of both manual and automatic types have been developed, and all appraisal has been on an arbitrary stain or scale. The British Fuels Research Station has been sampling for many years and has used a photometric comparison scale with weight equivalents for the type of atmospheres encountered in English cities. This approach, as well as the other methods used by the fuels research station, is covered completely in the Leicester report (5).

From the Leicester report, it is apparent that the British felt that the best methods which could be used were not in existence at the start of their investigation, hence they compromised on procedures and devices which could be widely used and which would yield pertinent data. The methods used in their study, and now applied on a countrywide basis in England, Scotland, Wales, and North Ireland, employ a standard settling jar and a filter stain procedure combined with an SO<sub>2</sub> determination by absorption in a standard iodine solution. In addition, monthly H<sub>2</sub>SO<sub>4</sub> evaluations using an exposed lead peroxide procedure have given them an index of corrosive effects of the acid in the atmosphere.

At the present time, several hundred stations in the British Isles make monthly reports of soluble and insoluble deposit (total solids) from the settling jar, and of SO<sub>3</sub> concentrations as acid in milligrams per day per 100 square centimeters of exposed lead peroxide. Sulfur dioxide in parts per 100,000,000 parts of air, and smoke values as filter stain in milligrams per 100 cubic meters are also reported.

Since a major portion of the pollution in Great Britain results from combustion of solid fuels, that nation's approach to the sampling problem is not complicated by special situations and contaminants such as exist in Los Angeles and certain other locations in the United States. Nevertheless, the devices the British have standardized can yield information of importance in



determining the background of American cities and towns.

None of the British methods or those used by investigators in this country can be considered as absolute. The problem of sampling has so many inherent difficulties and so much variability owing to industrial process and meteorologic conditions that it is doubtful whether absolute methods are essential. But whether a particular device selected can give reproducible and consistent results for a known atmosphere is the important factor to determine.

From this brief discussion of methods, it is apparent that simple, direct procedures are the ones which should be applied first to give an estimate of the overall background. These can be modified and improved to provide for special situations if necessary. For example, in sampling suspended solids or particulates a wide variety of filter media are available, and precipitation methods can be used for even smaller sizes, although they may require more elaborate equipment. If filtration procedures are employed, it is possible to obtain stain, weight, and chemical analyses without difficulty. It can be expected that even more efficient media can be developed if necessary.

### Research in Progress

Much of the research in progress on sampling instruments has been performed in conjunction with various air pollution surveys. The most recent examples are those relating to the Los Angeles smog problem, conducted by the Stanford Research Institute and the Los Angeles Air Pollution Control Board, and the Detroit-Windsor air pollution survey, which is a joint United States-Canadian project involving the Public Health Service and the Canadian Government.

In Los Angeles, the Stanford group is working on oxidants and direct measurement of hydrocarbons in the air by infrared absorption spectrophotometers. Some work along these lines is also conducted by the Los Angeles County Air Pollution Control Board in its activities.

At Detroit and Windsor, Ont., surveys of neighborhood pollution by gas analysis for sulfur dioxide, fallout, and suspended material

determinations have been made on a large scale, but most of the instrumentation has utilized modifications of existing devices and newer recorder developments. Some instrument development suitable for survey work has been done by the New York City office of the Atomic Energy Commission, and by the Armour Research Foundation, the University of Illinois, Harvard University, the University of Washington, and by the Robert A. Taft Sanitary Engineering Center and the Occupational Health Program of the Public Health Service. Other institutions have also made considerable investigations into aerosol technology and applications of present sampling instruments to certain problems.

Aside from developing or applying methods for specific problems, very little effort has been devoted to approaching the problem on a national basis. The work of the recently established American Society for Testing Materials D-22 (methods of atmospheric sampling and analysis) Committee may contribute materially to the problem by the development of tentative standards for various sampling and analytical methods.

### Needed Areas of Research

Actually, the research to be done on sampling instruments is of such nature that extensive laboratory or field work is not necessary at present. The application of standard meteorologic precipitation gauges for determining soluble and insoluble deposits may require some study, and it is hoped that this can be done. The selection of suitable suspended-matter samplers also needs some study as to rate, media, and the type of analysis to be applied. Work on gas sampling is of secondary importance, since suitable sulfur and acid gas recorders such as the Thomas autometer and the Titrilog are available, and simple gas-absorption instruments such as those used at Leicester are also readily obtained or assembled. The basic research data to be obtained are essentially field records of particulate fall and suspended matter on a national and geographic basis, coordinated and correlated with existing meteorologic information for the sampling period. In areas such as Los Angeles gas sampling may be of

# Comparison of various devices commonly

Instrument	Type of contaminant	Application	Sample volume
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## Method: sedimentation

Settling pan <sup>1</sup> -----	Particulate-----	General atmospheres and stacks (low concentrations)	440 ml.-----
Sedimentation cell <sup>2</sup> -----	do-----	do-----	50 ml., small-----

## Method: visual or photometric absorption

Ringelmann chart <sup>3</sup> -----	Particulate-----	Stacks and high concentra- tions.	-----
Tyndallometer <sup>4</sup> -----	do-----	do-----	-----
Photoelectric densitometer <sup>5</sup> -----	do-----	do-----	-----

## Method: inertial and centrifugal force

Labyrinth <sup>6</sup> -----	Particulate-----	Stacks and process effluents-----	Large-----
Midget cyclone <sup>7</sup> -----	do-----	do-----	do-----
Aerotec tube design <sup>8</sup> -----	do-----	do-----	do-----

## Method: impingement (impaction and jet condensation)

Owens <sup>9</sup> -----	Particulate-----	General atmospheres and after gas-cleaning devices.	50-100 ml., small-----
Konimeter <sup>10</sup> -----	do-----	do-----	2.5-5 ml., small-----
Bausch and Lomb <sup>11</sup> -----	do-----	do-----	0.001 cu. ft.-----
Impinger <sup>12</sup> -----	Particulate and gas- eous.	do-----	Medium-----
Cascade impactor <sup>13</sup> -----	Particulate-----	do-----	Small-----

used for stack, effluent, and aerosol sampling

Sampling rate	Particle size range	Remarks
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Method: sedimentation

Unknown.....	High-low, 10-mesh-variable.	Not usually used in stack sampling because size of aliquot is not representative. Efficiency of settling pan unknown; of sedimentation cell, 100 percent. Difficulty in Green cell is one of microscopic measurement; also requires long settling time for small sizes. Instruments require little skill for operation, analytic skill for quantitation (methods: weight, count, or chemical analysis).
Instantaneous.....	10-mesh-0.2 $\mu$ .....	

Method: visual or photometric absorption

Variable.....	10-0.1 $\mu$ .....	Subject to many limitations cited in the reference. <sup>3</sup> Direct reading only. Requires some skill in operation, little in quantitation (method: comparison with standards). Direct reading only. Has largely been replaced by direct reading photometric units. Requires some skill in operation and quantitation (method: visual recording). Devices of this type have been improved, and several designs have been developed. The latest include electronic methods of counting particles but only in dilute suspensions. Direct reading only. Requires some skill in operation and quantitation (method: photometric density).
do.....	do.....	

Method: inertial and centrifugal force

Variable.....	10-mesh-1 $\mu$ .....	Labyrinth device separates material in proportion to terminal velocity. Efficiency of all inertial or centrifugal separating devices varies with sampling rate and particle size. Efficiency of labyrinth device unknown. Efficiencies of the others are on a weight basis: cyclone device, 98 percent; tube, 94; but on a count basis, efficiency values obtained are all less than 50 percent. These instruments require some skill in operation and analytic skill in quantitation (methods: weight, count, or chemical analysis).
25-50 cu. ft./min.....	10-mesh-5 $\mu$ .....	
35 c.f.m.....	do.....	

Method: impingement (impaction and jet condensation)

Instantaneous.....	10-0.2 $\mu$ .....	Adapted to low concentrations only. Particle sizing may be done directly on slide. 99 percent efficient. Requires some skill in operation, considerable skill in quantitation (method: count).
do.....	do.....	Adapted to low concentrations only. 99 percent efficient. Requires some skill in operation, considerable skill in quantitation (method: count).
do.....	do.....	Modified Owens with simplified darkfield counting microscope integral with instrument. 99 percent efficient. Requires some skill in operation and quantitation (method: count).
1 c.f.m.....	25-0.5 $\mu$ .....	Can be used for both gases and particulate material. 93-96 percent efficient, but if operated at sonic nozzle velocity, efficiency for particles as small as 0.1 $\mu$ reportedly 100 percent. Can only be used for readily soluble gases. Requires considerable skill in operation and quantitation (methods: count, weight, or chemical analysis).
17 liters/min.....	100-0.2 $\mu$ .....	Provides rapid means of fractionating aerosol by terminal velocity. Not well adapted to high concentrations if slides are to be counted. 95 percent efficient; for absolute efficiency, use sonic velocity in last stage. Requires considerable skill in operation and quantitation (methods: count or chemical analysis).

# Comparison of various devices commonly

Instrument	Type of contaminant	Application	Sample volume
Method: filtration			
Paper thimble <sup>14</sup>	Particulate	Stack and general atmospheres	
Paper disks or pleated paper <sup>15</sup>	do	do	Small, medium, or large.
Cotton, wool, or asbestos bags <sup>16</sup>	do	do	Large
Glass fibers, cloth, or alundum thimbles. <sup>17</sup>	do	do	Small, medium, or large.
Wire screen or gauge <sup>18</sup>	do	do	Large
Volatile or soluble crystals <sup>19</sup>	do	do	Small, medium, or large.
Millipore or molecular filter <sup>20</sup>	do	do	Small
All-glass web filter, 1106B or 935B <sup>21</sup>	do	do	Small, medium, or large.
Method: washing or scrubbing			
Simple bubbling devices <sup>22</sup>	Gaseous and particulate.	Stack and general atmospheres	Small
Sintered glass absorbers <sup>22</sup>	do	do	do
Wetted packed towers (bead columns, etc.). <sup>22</sup>	do	do	Medium



used for stack, effluent, and aerosol sampling—Continued

Sampling rate	Particle size range	Remarks
Method: filtration		
1-3 c.f.m.-----	10-mesh-0.2 $\mu$ -----	Not adapted to high temperatures or moist atmospheres. 95 percent efficient. Requires some skill in operation and quantitation (methods: weight, stain, count, or chemical analysis).
1-3 c.f.m. 40-60 c.f.m.	-----do-----	Can measure quantitatively by discoloration in low concentrations. "Tar Camera," American Society of Heating and Ventilating Engineers, Bureau of Standards use modifications. 99 percent efficient. Requires some skill in operation, analytic skill in quantitation (methods: weight, stain, count, or chemical analysis).
10-50 c.f.m.-----	10-mesh-1 $\mu$ -----	Life is limited; handling of sample for particle sizing is difficult. 99 percent efficient. Requires some skill in operation, analytic skill in quantitation (methods: weight, stain, count, or chemical analysis). Primarily adapted to weight determination.
1-3 c.f.m.-----	-----do-----	Alundum filters possess high flow resistance. 90-95 percent efficient; glass cloth and fibers may have low efficiency if fibers not fine or well packed. Glass filters (sintered or fibers) appear to give good results. Requires some skill in operation and analytic skill in quantitation (methods: weight, stain, count, or chemical analysis).
1-10 c.f.m.-----	10-mesh-10 $\mu$ -----	Material for screen is 400-mesh cloth (expensive). Efficiency variable, 50-70 percent. Not satisfactory for fine materials until bed has accumulated. Requires some skill in operation and in quantitation (methods: weight, stain, count, or chemical analysis).
1-30 c.f.m.-----	10-mesh-0.2 $\mu$ -----	Not adapted to high temperatures. 35-90 percent efficient. Industrial Hygiene Foundation has modified method for high volume sampling. Requires some skill in operation, analytic skill in quantitation (methods: weight, stain, count, or chemical analysis).
1-3 c.f.m.-----	10-mesh-0.1 $\mu$ -----	Not adapted to high temperatures or many organic solvents. Can be made transparent with immersion oil for direct observation. More than 99.9 percent efficient. Requires some skill in operation, analytic skill in quantitation (methods: weight, stain, count, or chemical analysis).
1-50 c.f.m.-----	-----do-----	Will withstand temperatures to 1000° F. More than 99.9 percent efficient. Requires some skill in operation, analytic skill in quantitation (methods: weight, stain, count, or chemical analysis).

Method: washing or scrubbing

0.5-1 c.f.m.-----	10-mesh-10 $\mu$ -----	90-95 percent efficient; efficiency low for particulate material unless very coarse; efficiency for gases is dependent on their solubility and rate of reaction. Requires some skill in operation, analytic skill in quantitation (methods: chemical analysis or weight).
0.1-0.5 c.f.m.-----	10-0.2 $\mu$ -----	95 percent efficient; highest efficiency devices for gases; for particulate material rate must be kept low. Porosity of sintered glass affects efficiency since separation is due to filtration and scrubbing. Requires some skill in operation, analytic skill in quantitation (methods: chemical analysis or weight).
1-3 c.f.m.-----	10-mesh-10 $\mu$ -----	Efficiency (90-95 percent) depends on solubility and reactivity of gas and absorbent. Particulate material is retained in proportion to porosity of packing and velocity. Requires considerable skill in operation, analytic skill in quantitation (methods: chemical analysis or weight).

# Comparison of various devices commonly

Instrument	Type of contaminant	Application	Sample volume
Method: washing or scrubbing—Continued			
Venturi scrubber <sup>23</sup> -----	Gaseous and particulate.	Stack and general atmospheres.	Large-----
Method: precipitation			
Thermal precipitator <sup>24</sup> -----	Particulate-----	General atmospheres and after cleaning devices.	Small-----
Electrostatic precipitator <sup>4 17</sup> -----	do-----	Stack and general atmospheres.	Small, medium, or large.
Method: adsorption			
Tubes or cartridges filled with activated charcoal, silica gel, or alumina. <sup>25</sup>	Gaseous-----	Stack and general atmospheres.	Small, medium, or large.
Method: absorption (on solids)			
Tubes or cartridges filled with dry solid chemical. <sup>9</sup>	Gaseous-----	Stack and general atmospheres.	Small-----
Method: condensation			
Freezing trap <sup>9</sup> -----	Gaseous-----	Stack and general atmospheres.	Small-----

<sup>1</sup> Shaw and Owens: The smoke problem of great cities. London, Constable & Co., Ltd., 1925.

<sup>2</sup> Green: J. Indust. Hyg. 16: 29 (1934).

<sup>3</sup> Marks: Mech. Engin. 59: 681 (1937).

<sup>4</sup> Drinker and Hatch: Industrial dust. New York, McGraw-Hill, 1936.

<sup>5</sup> Hill: J. Scient. Instr. 14: 296 (1937).

<sup>6</sup> Briscoe et al.: Tr. Inst. Min. and Met. (June 1937).

<sup>7</sup> Stern: Combustion 4: 35 (1933).

<sup>8</sup> The Thermix Corporation, Greenwich, Conn., 1949.

<sup>9</sup> Jacobs: The analytical chemistry of industrial poisons, hazards, and solvents. Ed. 2. New York, Interscience, 1949.

<sup>10</sup> Brown, Schrenk, and Littlefield: U. S. Bureau of Mines Information Circular 6993, February 1938.

<sup>11</sup> Gurney, Williams, and Meigs: J. Indus. Hyg. & Toxicol. 20: 24 (1938).

<sup>12</sup> Bloomfield and Dalla Valle: Pub. Health Bull. No. 217, Washington, D. C., 1935.

used for stack, effluent, and aerosol sampling—Continued

Sampling rate	Particle size range	Remarks
Method: washing or scrubbing—Continued		
30–40 c.f.m.-----	10-mesh–0.2 $\mu$ -----	A portable device using the principle of the Pease-Anthony unit. Collecting medium is recirculated. Adapted to both gaseous and particulate material, but the gases should be readily soluble in water or absorbent. 90–95 percent efficient; efficiency on particulates is low. Requires considerable skill in operation, analytic skill in quantitation (methods: chemical analysis or weight).
Method: precipitation		
5–10 ml./min.-----	5–0.2 $\mu$ -----	Not adapted to high concentrations or large particles. Excellent for particle sizing including electron micrograph work. 99 percent efficient. Requires considerable skill in operation and quantitation (method: count).
1–3 c.f.m.-----	80–0.2 $\mu$ -----	May be used in AC or DC form; DC more practical for field use and requires less voltage. For hot gases arcing becomes a problem. Large particles may not be trapped, but pre-cleaner can be used in series. 99 percent efficient. Requires some skill in operation and quantitation (methods: count, weight, or chemical analysis).
Method: adsorption		
1–10 l.p.m.-----	Gases-----	Applicable only to gases which can be adsorbed readily at normal temperatures. Volume of sample collected must be held within adsorptive capacity. Adsorbent may be stripped for chemical or physical analysis. 99 percent efficient. Requires considerable skill in operation and some in quantitation (methods: chemical analysis or weight).
Methods: absorption (on solids)		
1–10 l.p.m.-----	Gases-----	Typical use is to determine acid gases on soda lime or alkali. Moisture interference must be eliminated. 99 percent efficient. Requires some skill in operation and quantitation (method: weight).
Method: condensation		
0.01–1 l.p.m.-----	Gases-----	Applicable to wide variety of materials depending on temperature of freezing bath (dry ice or liquid nitrogen). 99 percent efficient. Requires considerable skill in operation and quantitation (method: chemical analysis).

<sup>13</sup> May: J. Scient. Instr. 22: 187 (1945); Sonkin: J. Indust. Hyg. & Toxicol. 28: 269 (1946).

<sup>14</sup> Brady and Touzalin: Indust. & Engin. Chem. 3: 662 (1911).

<sup>15</sup> Katz and Smith: U. S. Bureau of Mines, Report of Investigations 2378, 1922.

<sup>16</sup> Bubar, H. H.: Bagtest sampler. Old Lyme, Conn.

<sup>17</sup> Western Precipitation Corp. Bull. WP50, 1948.

<sup>18</sup> Hardie: Tr. Am. Soc. Mech. Engr. 59: 355 (1937).

<sup>19</sup> Matthews: Analyst 63: 467 (1938).

<sup>20</sup> First and Silverman: Arch. Indust. Hyg. & Occup. Med. 7: 1 (1953).

<sup>21</sup> Mine Safety Appliances Co., Pittsburgh.

<sup>22</sup> Silverman: Industrial air sampling and analysis. Chem. & Tox. Bull. No. 1. Industrial Hygiene Foundation, Pittsburgh.

<sup>23</sup> Magill: Stanford Research Inst., 1949; Collins, Seaborne, and Anthony: Paper Trade Journal, January 5, 1948.

<sup>24</sup> Watson: Tr. Faraday Soc. 32: 1073 (1936).

<sup>25</sup> Cook and Coleman: J. Indust. Hyg. & Toxicol. 18: 194 (1936).

greater importance because of the hydrocarbon problem.

It is also desirable to analyze and correlate information on the general distribution of specific tracer materials, such as pollen and identifiable dusts, in order to determine travel and upper air current transmission under a variety of meteorologic conditions. This may give an insight into the interstate and intercity transmission of pollution.

### Recommendations

General particulate or dust-fall measurements on a countrywide basis should be initiated at the earliest opportunity. As a basis for some correlation, it is proposed that weather stations could utilize United States standard rain gauge accumulations which can be filtered, dried, and weighed to give the amount of total undissolved solids. The filtrate can be evaporated and weighed, if desired, to give dissolved solids or salts. The total undissolved solids can be analyzed further; as complete an analysis as can be obtained of the nature of the deposits would be desirable.

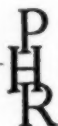
General filter samples of airborne particulates should be obtained, and some standardization, within reasonable limits in the light of present knowledge, should be achieved in regard to type of filter media, sampling rate, sample volume, and weighing techniques. Simultaneous collection with particulate fall or settling cans should be made if possible. To obtain any possible relationship between dust-fall and suspended matter, samples of each should be taken simultaneously or over comparable periods.

An evaluation of existing information now available and being collected by various Federal, State, and local groups, such as the Public Health Service, the Atomic Energy Commission, and the various air pollution boards, would be desirable to ascertain the present general levels in air with respect to intercity and interstate migration of pollution and to provide background for appraisal of conditions and their trend.

Whenever possible, correlation with accidental releases of large amounts of foreign materials and severe weather conditions should be obtained. Some effort in this direction has been made already by the Atomic Energy Commission, the Weather Bureau, and the Public Health Service.

### REFERENCES

- (1) Silverman, L.: Industrial air sampling and analysis. Industrial Hygiene Foundation Chemistry and Toxicology Series, Bull. No. 1. Pittsburgh, The Foundation, 1947.
- (2) Silverman, L.: Sampling of industrial stacks and effluents for atmospheric control. In Proceedings of the first National Air Pollution Symposium, sponsored by the Stanford Research Institute. Palo Alto, Calif., The Institute, 1949, pp. 55-60.
- (3) Friedlander, S. K., Silverman, L., Drinker, P., and First, M. W.: Handbook on air cleaning. (Department of Industrial Hygiene, Harvard University.) Washington, D. C., U. S. Government Printing Office, 1952.
- (4) Magill, P. L.: Sampling procedures and measuring equipment. In Air pollution abatement manual, by the Manufacturing Chemists Association. Washington, D. C., The Association, 1954, pp. 1-39.
- (5) Great Britain. Department of Scientific and Industrial Research. Atmosphere pollution in Leicester. In Atmospheric pollution control. Technical Paper No. 1. London, His Majesty's Stationery Office, 1945.





*A well-controlled 10-year epidemiological study of two population groups shows that excess amounts of fluoride in a water supply do not produce gross physical defects.*

## Medical Aspects of Excessive Fluoride In a Water Supply

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THE STUDY of a group of people living in Bartlett and Cameron, Tex., reported here is one of several related studies designed to provide information on the effects of excessive amounts of fluoride occurring naturally in a water supply.

Previous investigations (1-3) indicate a need for additional information on the effects of pro-

longed fluoride exposure. Moreover, other studies have related, in a limited number of people, physiological reactions to the presence of excess fluoride, but have not defined the prevalence or incidence of these characteristics in the exposed group (2-4).

Bartlett, Tex., was selected as a study area because the town's water supply contained 8 p.p.m. fluoride (F), one of the higher fluoride levels of public drinking water in the United States. A town with a water supply naturally containing excessive fluoride was selected on the assumption that any association between exposure and physiology might be manifest at a high fluoride concentration, particularly after prolonged ingestion. Cameron, Tex., was selected as the control study area. The Cameron water supply contains 0.4 p.p.m. F. Both towns are similar with respect to geography, racial composition, and principal occupation, which is agriculture. Each participant in the study was required to have been a resident of one of these towns for 15 consecutive years prior to 1943.

The medical history of the participants since birth was recorded at the start of the study, and their medical experience during the 10-year period 1943 to 1953 was carefully reviewed.

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*This paper is part of a symposium of 11 papers which is being published by the American Association for the Advancement of Science in a volume entitled "Fluoridation as a Public Health Measure."*

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**Table 1. Composition of water,<sup>1</sup> Bartlett and Cameron, Tex., 1943 and 1953**

Components	Bartlett			Cameron	
	Raw water		Defluoridated water	Raw water	
	January 1943 <sup>1</sup>	December 1953	December 1953	January 1943	December 1953
Dissolved solids	1,698.4	1,708.8	1,701.2	435.2	363.6
Loss on ignition	40.0	34.4	16.0	66.4	60.8
Fixed residue	1,658.4	1,674.4	1,685.2	368.8	302.8
Silica (SiO <sub>2</sub> )	15.2	16.0	17.6	6.4	5.6
Iron (Fe)	0.03	0.01	0.01	0.02	0.02
Aluminum (Al)	0.0	0.00	0.02	0.07	0.01
Calcium (Ca)	19.4	24.6	21.2	74.3	85.8
Magnesium (Mg)	11.5	11.4	11.4	20.6	8.4
Sodium and potassium (calculated as Na)	588.9	585.7	582.2	46.6	22.6
Carbonate (CO <sub>3</sub> )	0.0	7.2	2.4	0.0	1.2
Bicarbonate (HCO <sub>3</sub> )	485.6	458.7	451.4	258.6	168.0
Sulfate (SO <sub>4</sub> )	482.2	471.9	493.6	65.8	93.0
Nitrate (NO <sub>3</sub> )	2.2	0.22	1.33	4.4	4.2
Chloride (Cl)	319.0	325.9	323.5	63.0	30.4
Phosphate (PO <sub>4</sub> )	0.0	0.0	0.0	0.0	0.0
Fluoride (F)	8.0	7.6	1.2	0.4	0.5

<sup>1</sup> The 1943 water analyses were made by Elvove (6), the fluoride determinations by means of the zirconium-alizarin reagent. The 1953 fluoride analyses were done by the method described by McClure (7). Both investigators are from the National Institutes of Health. Phosphates were determined by an adaptation of the colorimetric method of Benedict and Theis (8). Determinations other than fluoride and phosphate were made according to the Standard Method of Water Analysis of the American Public Health Association.

This permitted a comparison of the individuals in each group with themselves and of those in a high-fluoride group with those in a low-fluoride group.

The study has produced findings of two types—those that can be enumerated and analyzed by statistical techniques and those that

are classified as clinical impressions. The latter are more difficult to evaluate, but are important in the analysis of specific clinical problems.

This paper is concerned with the statistical analysis of the results of the study. Clinical impressions will be evaluated in subsequent papers, in which the medical, X-ray, and dental findings will be presented in more detail.

**Table 2. Distribution of participants by locality, age, and sex, based on 1943 age**

Age group (years)	Bartlett			Cameron		
	Male	Female	Total	Male	Female	Total
15-24	5	16	21	11	7	18
25-29					5	5
30-34	2	4	6	1	6	7
35-39	5	11	16	6	12	18
40-44	1	7	8	6	11	17
45-49	7	6	13	11	15	26
50-54	7	15	22	4	8	12
55-59	3	11	14	4	9	13
60-64	7	3	10	2	1	3
65-69	2	3	5	1	1	2
70+		1	1			
Total	39	77	116	46	75	121

### Characteristics of Study Areas

Bartlett and Cameron are geographically located on a triangle with Temple, Tex., which is 135 miles due south of Dallas. Bartlett is 20 miles south and Cameron is 38 miles southeast of Temple. The two towns are about 25 linear miles apart but are not connected by a direct road. In 1940, the populations of Bartlett and Cameron were 1,668 and 5,040; and in 1953, 1,706 and 5,272, respectively.

Prior to 1943, there were usually 2 practicing physicians and 1 dentist in Bartlett; 10 physicians and 6 dentists in Cameron. During the 1953 survey, there were 1 practicing physician

and 1 dentist in Bartlett, and 8 physicians and 4 dentists in Cameron. Bartlett residents are also seen by physicians in nearby Temple and Taylor, and Cameron residents are served by the medical profession in Temple and Marlin.

### Bartlett

The municipal water supply of Bartlett, serving the entire town, comes from two deep wells of approximately the same depth. Well No. 1 was drilled to 2,005 feet in 1901; well No. 2, to 1,595 feet in 1936. By the latter year, both were plugged to 1,040 feet. Both wells are now pumping at the 240-foot level, each with a free-flowing capacity output of 220 gallons per minute.

Until March 11, 1952, the raw water was pumped into three storage tanks, from which it entered directly into the general distribution system (5). Repeated analyses of the Bartlett

water supply have shown a fluoride level ranging from 7.6 to 8.2 p.p.m. F since the municipal water supply has been in use. Few sizable communities in the United States use water supplies with a fluoride concentration in excess of 6 p.p.m. F.

Table 1 shows the typical composition of the raw water supplies of Bartlett and Cameron during the period of study. On March 11, 1952, an experimental defluoridation unit was installed in Bartlett, and the table also shows the composition of the defluoridated water on the day the raw water was sampled.

Since the installation of the defluoridation unit, the fluoride content of the water has varied considerably. However, it has remained somewhat above the desired level of 1.0 p.p.m. F. "Optimal defluoridation" has not been achieved without interruption because of necessary changes in the experimental unit (5). By 1953

**Table 3. Distribution of participants, by locality, age, and sex, based on 1953 age**

Age group (years)	Examined						Not exam- ined	Deceased		
	1943			1953				Male	Female	Total
	Male	Female	Total	Male	Female	Total				
Bartlett										
25-29	5	12	17	5	9	14	3			
30-34		4	4		2	2	3			
35-39										
40-44	2	3	5	2	3	5				
45-49	4	11	15	4	10	14				
50-54	2	6	8	2	6	8				
55-59	6	8	14	3	8	11		3		3
60-64	10	13	23	8	13	21		1	1	2
65-69	2	11	13	1	9	10		1	2	3
70+	8	9	17	6	5	11		3	3	6
Total	39	77	116	31	65	96	6	8	6	14
Cameron										
25-29	11	6	17	9	6	15	2			
30-34		1	1		1	1				
35-39		5	5		4	4	1			
40-44	1	4	5	1	4	5				
45-49	6	13	19	6	13	19				
50-54	6	11	17	5	11	16		1		1
55-59	11	13	24	11	12	23	1			
60-64	4	10	14	4	10	14				
65-69	4	10	14	2	9	11		2		2
70+	3	2	5	2	3	5		1		1
Total	46	75	121	40	73	113	4	4		4

**Table 4. Distribution of removed participants, 1943 to 1953, by age and sex**

Age group (years)	Examined			Not examined <sup>1</sup>			Total
	Male	Female	Total	Male	Female	Total	
Bartlett							
25-29	2	7	9		3	3	12
30-34		1	1		3	3	4
35-39							
40-44	1		1				1
45-49							
50-54		1	1				1
55-59							
60-64	1	1	2				2
65-69		2	2				2
70+							
Total	4	12	16		6	6	22
Cameron							
25-29	8	3	11	2		2	13
30-34		1	1				1
35-39		2	2		1	1	3
40-44							
45-49	1	1	2				2
50-54		2	2				2
55-59	1	1	2		1	1	3
60-64		1	1				1
65-69							
70+							
Total	10	11	21	2	2	4	25

<sup>1</sup> Medical history in 1953, but no physical, laboratory, or X-ray examination.

the Bartlett participants in the study had ingested fluorides at high levels for an average of 36.7 years. Any significant physiological manifestations of prolonged exposure would not be expected to have regressed materially in the 18 months of partial defluoridation.

#### *Cameron*

Cameron has taken its raw water from the Little River since 1895. Sedimentation basins were installed in 1911 and floored in 1929. The water has been alum treated since 1911, chlorinated since 1919, and carbon treated since 1936. The present treatment consists of prechlorination, coagulation with alum and lime, sedimentation, and postchlorination. Occasionally, activated carbon is added for the control of taste and odor. The plant is not equipped with filters. In 1953 a pressure tank was added to the system. (See table 1 for water analyses.)

#### **Procedure**

In 1943, a medical-dental team from the Public Health Service examined 116 participants in Bartlett and 121 in Cameron. At that time, the participants' ages ranged from 15 to 68 years, in both towns. All were of the white race.

The group was selected by a survey covering approximately every household in Bartlett and every third household in Cameron. An adult member of each household was interviewed and a "household roster" card was filled out. In addition, a "residence and water history" card was made for each household member. On the basis of the data obtained, a random sample was selected from those who met the basic requirement—15 years or more of continuous residence prior to 1943.

The 1953 investigation involved the location and study of the group 10 years later and a re-examination of as many participants as possible.



**Table 5. Percentage distribution of participants by age groups, based on 1953 age**

Age group (years)	Bartlett		Cameron	
	1943	1953	1943	1953
25-29	14.7	14.6	14.0	13.3
30-34	3.4	2.1	.8	.9
35-39			4.1	3.5
40-44	4.3	5.2	4.1	4.4
45-49	12.9	14.6	15.8	16.8
50-54	6.9	8.3	14.0	14.2
55-59	12.1	11.5	19.9	20.4
60-64	19.8	21.8	11.6	12.4
65-69	11.2	10.4	11.6	9.7
70+	14.7	11.5	4.1	4.4
Total	100.0	100.0	100.0	100.0

The 1943 and 1953 investigation procedures were essentially parallel. These included a medical history, physical and dental examinations, X-rays, and blood and urine studies. Both sets of data were recorded on punchcards to facilitate comparison. In the 1943 study, the

physical and dental examinations and the laboratory work were done locally in the respective towns, but the patients were later transported to the Scott and White Clinic in Temple, Tex., for X-rays.

The 1953 procedure differed slightly in that the majority of physical and laboratory examinations, as well as X-rays, were performed at the Scott and White Clinic by Public Health Service personnel. Blood and urine analyses were done by the Scott and White Clinic laboratory technicians, and the chief of the X-ray department supervised the taking of X-ray films and made the initial interpretations. The films were later evaluated independently by Theodore F. Hilbisch, chief, Department of Diagnostic X-ray, Clinical Center, National Institutes of Health, and Merrill C. Sosman, chief, department of radiology, Peter Bent Brigham Hospital, Boston.

Approximately 71 percent of the 237 participants in the 1943 survey still resided in Bart-

**Table 6. Incidence of abnormal clinical findings, 1943 to 1953**

[Participants residing in study area for the 10-year period]

Characteristic studied	Bartlett			Cameron			Significant difference (P=0.05)
	Number at risk	Number abnormal	Rate (per cent)	Number at risk	Number abnormal	Rate (per cent)	
Arthritic change	80	11	13.8	89	13	14.6	No.
Blood pressure:							
Systolic 151 mm/Hg and over	58	18	31.0	81	20	24.7	No.
Diastolic 100 mm/Hg and over	73	11	15.1	83	11	13.3	No.
Pulse pressure 75 mm/Hg and over	70	9	12.9	89	16	18.0	No.
Bone changes: <sup>1</sup>							
Density	74	<sup>2</sup> 7	9.5	81	<sup>3</sup> 2	2.5	No.
Coarse trabeculation	74	4	5.4	81	2	2.5	No.
Hypertrophic	74	8	10.8	81	6	7.4	No.
Spurs	74	1	1.4	81	4	4.9	No.
Osteoporosis	74	5	6.8	81	10	12.3	No.
Bone, increased density (new cases)	66	1	1.5	79			
Cataract and/or lens opacity	79	8	10.1	85	12	14.1	No.
Thyroid	74	3	4.1	82	6	7.3	No.
Cardiovascular system (except uncomplicated hypertension)	80	10	12.5	92	22	23.9	Yes.
Hearing (decreased acuity)	72	14	19.4	78	10	12.8	No.
Tumor and/or cysts	80	12	15.0	92	10	10.9	No.
Fractures	80	12	15.0	92	7	7.6	No.
Urinary tract calculi	72	14	19.4	76	12	15.8	No.
Gallstones	73	0	0.0	80	1	1.2	No.

<sup>1</sup> Bone changes determined by simultaneous reading of identical views of X-rays taken in 1943 and repeated in 1953.

<sup>2</sup> Increased density, 4; decreased density, 3.

<sup>3</sup> Increased density, 2.

## PHS Examining Teams

1943

Physicians: J. W. Hawkins, M. B. Shimkin, Chester Brown

Dentist: F. A. Arnold, Jr.

Nurses: Christine Mason, Mary Harte

Technician: Steel Davis

1953

Physician: N. C. Leone

Dentist: E. R. Zimmermann

Nurse: Patricia Geiser

Assistants: Vona Harrell, F. D. Baty, Elaine Pickett

lett and Cameron in 1953. Information on the deceased, another 8 percent, was obtained from the next of kin, and copies of the death certificates were obtained to establish cause of death. Because of the unusual success in accounting for 79 percent of the participants locally, it was deemed advisable to follow up the remaining 21 percent of the participants who had moved from the study areas. All of the 1943 participants, living and deceased, were accounted for in the 1953 study (tables 3 and 4).

A total of 47 participants had moved from the 2 towns by 1953. Of these, 37 were examined and the data were obtained by the same procedures as used for the persons who remained. Forty-three of the "removed" participants still lived in Texas. Two had moved to California, 1 to Oklahoma, and 1 to New York City.

The 10 living participants who were not examined were interviewed by personal contact, telephone, or mail, and a 10-year medical and residence history was obtained. None reported acute, chronic, serious, or debilitating illnesses.

### *Physical Examination*

In 1943 and again in 1953, a medical and residence history was obtained for each person in the study. At the conclusion of the examinations, a summary of the findings in each case was prepared for the family physician.

The laboratory blood studies in 1943 and 1953 included a determination of hemoglobin, red and white blood counts, a differential white count, and a serologic test for syphilis. Urine determinations included specific gravity, qualitative albumin and sugar, and microscopic examination.

In 1953, additional procedures were included. Rectal and pelvic examinations of most of the females and prostate examinations of males were routine. Hematocrit, sedimentation rate, and blood calcium were determined, and when indicated, further studies were made, such as acid and alkaline phosphatase, blood sugar, and special hematology. Consultant service was used when needed.

**Table 6A. Incidence of abnormal clinical findings, 1943 to 1953**

[Removed participants]

Characteristic studied	Bartlett		Cameron	
	Num- ber at risk <sup>1</sup>	Num- ber ab- normal	Num- ber at risk <sup>1</sup>	Num- ber ab- normal
Arthritic change.....	16	0	21	2
Blood pressure:				
Systolic 151 mm/Hg and over.....	16	2	19	1
Diastolic 100 mm/Hg and over.....	16	0	21	0
Pulse pressure 75 mm/ Hg and over.....	16	2	19	0
Bone changes: <sup>2</sup>				
Density.....	15	0	20	<sup>3</sup> 1
Coarse trabeculation..	15	0	20	0
Hypertrophic.....	15	2	20	0
Spurs.....	15	0	20	0
Osteoporosis.....	15	0	20	0
Bone, increased density (new cases).....	15	0	20	0
Cataract and/or lens opacity.....	16	2	21	1
Thyroid.....	16	0	19	4
Cardiovascular system (except uncomplicated hypertension).....	16	4	21	2
Hearing (decreased acu- ity).....	16	0	21	1
Tumor and/or cysts.....	16	3	21	5
Fractures.....	22	2	25	2
Urinary tract calculi.....	16	0	21	2
Gallstones.....	15	0	20	0

<sup>1</sup> At risk for that part of the 10-year interval in which the participant resided in the study area.

<sup>2</sup> Bone changes determined by simultaneous reading of identical views of X-rays taken in 1943 and repeated in 1953.

<sup>3</sup> Decreased density, 1.

**Table 6B. Incidence of abnormal clinical findings, 1943 to 1953**

[Resident and removed participants]

Characteristic studied	Bartlett			Cameron		
	Number at risk	Number abnormal	Rate (percent)	Number at risk	Number abnormal	Rate (percent)
Arthritic change.....	96	11	11.5	110	15	13.6
Blood pressure:						
Systolic 151 mm/Hg and over.....	74	20	27.0	100	21	21.0
Diastolic 100 mm/Hg and over.....	89	11	12.4	104	11	10.6
Pulse pressure 75 mm/Hg and over....	86	11	12.8	108	16	14.8
Bone changes: <sup>1</sup>						
Density.....	89	<sup>2</sup> 7	7.9	101	<sup>3</sup> 3	3.0
Coarse trabeculation.....	89	4	4.5	101	2	2.0
Hypertrophic.....	89	10	11.2	101	6	5.9
Spurs.....	89	1	1.1	101	4	4.0
Osteoporosis.....	89	5	5.6	101	10	9.9
Bone, increased density (new cases).....	81	1	1.2	99		
Cataract and/or lens opacity.....	95	10	10.5	106	13	12.3
Thyroid.....	90	3	3.3	101	10	9.9
Cardiovascular system (except uncomplicated hypertension).....	96	14	14.6	113	24	21.2
Hearing (decreased acuity).....	88	14	15.9	99	11	11.1
Tumor and/or cysts.....	96	15	15.6	113	15	13.3
Fractures.....	102	14	13.7	117	9	7.7
Urinary tract calculi.....	88	14	15.9	97	14	14.4
Gallstones.....	88	0	0.0	100	1	1.0

<sup>1</sup> Bone changes determined by simultaneous reading of identical views of X-rays taken in 1943 and repeated in 1953.

<sup>2</sup> Increased density, 4; decreased density, 3.

<sup>3</sup> Increased density, 2; decreased density, 1.

The removed participants were given essentially the same examination by the same Public Health Service physician, who visited them at their current residence and arranged for their examination at a local medical facility.

#### *X-Ray Examination*

The X-rays taken at the Scott and White Clinic were made on a 500-ma. radiographic unit with rotating anode tube. Emphasis was placed on bone detail. Anteroposterior views of the dorsal spine, the lumbar spine, and the pelvis with the proximal third of the femur were taken for each patient. When a question of unusual findings arose, a radiographic bone survey was made, consisting of the following views: lateral skull, cervical spine, left upper arm, forearm and hand, and right femur, lower leg and foot.

The removed participants were similarly X-rayed at the nearest available facility. Both the 1943 and 1953 X-ray films, regardless of where they were taken, were independently evaluated by three roentgenologists.

#### *Oral Examination*

All physical examinations included an oral examination by the Public Health Service physician. In addition, the majority of participants seen at Scott and White Clinic in 1953 received a complete dental examination, including X-rays. Estimations were made on the degree and prevalence of dental fluorosis, caries experience, gingivitis, and alveolar bone loss. Dental X-rays were taken on all participants seen by the dentist, including edentulous persons, and the films were evaluated independently by four dentists. The presence or absence of dental fluorosis in the removed participants was determined by the examining physician.

#### **Evaluation of Findings**

The results of the study are discussed in terms of age and sex distribution of the participants and their medical experiences during the 10-year interval. The importance of age distribution and residence have been taken into consideration in the overall evaluation.

**Table 7. Prevalence of abnormal laboratory findings, 1943 and 1953**

[Participants residing in study area for the 10-year period]

Laboratory determination	Year	Bartlett			Cameron			Significant difference (P=0.05)
		Number examined	Number abnormal	Rate (percent)	Number examined	Number abnormal	Rate (percent)	
Hemoglobin-----	1943---	116	34	29.3	121	37	30.6	No.
	1953---	79	20	25.3	83	26	31.3	No.
Hematocrit-----	1943---							
	1953---	79	5	6.3	82	7	8.5	No.
Red blood count-----	1943---	116	25	21.6	121	24	19.8	No.
	1953---	80	6	7.5	85	2	2.4	No.
White blood count-----	1943---	116	17	14.7	121	5	4.1	Yes.
	1953---	78	11	14.1	82	7	8.5	No.
Differential count:								
Neutrophiles-----	1943---	71	15	21.1	71	6	8.5	Yes.
	1953---	78	23	29.5	82	13	15.9	Yes.
Lymphocytes-----	1943---	71	2	2.8	71	1	1.4	No.
	1953---	78	35	44.9	82	36	43.9	No.
Eosinophiles-----	1943---	71	0	0.0	71	0	0.0	No.
	1953---	78	6	7.7	82	14	17.1	No.
Sedimentation rate-----	1943---							
	1953---	79	31	39.2	83	22	26.5	No.
Blood calcium-----	1943---							
	1953---	79	9	11.4	66	7	10.6	No.
Serologic test for syphilis-----	1943---	71	2	2.8	71	3	4.2	No.
	1953---	84	2	2.4	95	2	2.1	No.
Urine albumin-----	1943---	115	3	2.6	121	10	8.3	Yes.
	1953---	77	5	6.5	85	12	14.1	No.
Urine glucose-----	1943---	115	2	1.7	121	4	3.3	No.
	1953---	77	0	0.0	85	1	1.2	No.

#### *Age and Sex Distribution*

Table 2 gives the age-sex distribution of the original 1943 participants. Table 3 gives the age-sex distribution of the participants in the 1943 and 1953 surveys and the deceased during the 10-year period. In this and subsequent tables, the age groupings are on the basis of the participants' ages in 1953. Table 4 gives the age-sex composition of the group that moved from the study area in the 10-year interval, and table 5 shows the percentage distribution of all examined participants by age group.

Table 3 shows that in Bartlett and Cameron the ratio of male to female participants in both 1943 and 1953 is approximately 1 to 2. The male-female ratio for the entire populations in the towns is 0.9 to 1 in Bartlett and 1.1 to 1 in Cameron (9, 10).

The age distribution of the participants does not exactly parallel that of the populations. In 1943, 57.8 percent of the Bartlett participants were over 55 years of age (table 5), whereas persons 55 and over constituted about 50 percent of the total adult population. The comparable figures for Cameron are 47.2 percent and approximately 38 percent. This imbalance was due to the basic requirement of 15 years' continuous residence and the absence of males of military age.

The sex ratios of the participants were approximately the same in the two study areas, and the age distributions were similar though not exactly comparable, since in Bartlett the participants were predominantly older. The imbalance is particularly evident in the age group 70 and over. As a result, the difference



**Table 7A. Prevalence of abnormal laboratory findings, 1953**

[Removed participants]

Laboratory determination	Bartlett		Cameron	
	Number examined	Number abnormal	Number examined	Number abnormal
Hemoglobin.....	11	5	20	4
Hematoerit.....	10	0	20	1
Red blood count.....	11	0	18	3
White blood count.....	11	1	20	6
Differential count				
Neutrophiles.....	11	2	20	3
Lymphocytes.....	11	6	20	10
Eosinophiles.....	11	0	20	2
Sedimentation rate.....	10	5	20	2
Blood calcium.....	0	0	0	0
Serologic test for syphilis.....	5	0	7	0
Urine albumin.....	13	0	19	0
Urine glucose.....	13	0	19	0

between the age-corrected mortality rates is not significant by statistical analysis. (See table 3 for age-sex distribution of the deceased.)

#### *Removed Participants*

In table 4 the removed participants are subdivided into those who were examined (including X-ray and laboratory studies) and those who were not. The number of persons that left each town was almost equal, 22 from Bartlett and 25 from Cameron, predominantly of the younger age groups.

The average duration of continuous residence of all living participants examined was 36.7 years in Bartlett and 38.2 years in Cameron, and the corresponding averages for those who moved were 22.4 in Bartlett and 21.3 in Cameron.

#### *Results*

Table 6 shows the 10-year incidence rates for selected clinical findings of those who were at risk for the entire 10-year period. Table 6A shows the 10-year incidence figures for the same characteristics studied in the removed participants. Table 6B shows composite findings for all participants examined. Similarly, tables 7 and 7A show the prevalence data for abnormal laboratory findings, and table 7B is a composite of the data in the two tables. In the subse-

quent evaluation of data, the differences between the findings for the two towns are subjected to statistical analyses in order to test the hypothesis that Bartlett did not differ from Cameron with respect to the characteristics studied. (Each characteristic studied, laboratory determination, and dental finding was tested statistically for significant differences between towns. Approximately 40 tests were made. It was therefore expected that at least three characteristics would be judged significant as a consequence of the statistical procedure (11). It was necessary to use this statistical procedure because a main objective of the study was to determine which, if any, of the characteristics were important.)

The number of persons "at risk," as the term is used in the various tables, is the number of individuals who had a chance to acquire the "characteristic studied" during the 10-year interval. A participant was considered at risk only with respect to characteristics for which he was examined both in 1943 and 1953. The variation in the number at risk is largely due to the unavoidable omission of parts of examinations.

No attempt has been made to reconcile the differing concepts of "normal" with respect to the characteristics studied. Objective criteria, which apply equally to both towns, were chosen to designate the "abnormals." The purpose of these criteria was to form a dichotomy of the participants with respect to each characteristic, to permit statistical evaluation. The ranges, standards, and definitions used are given on page 935.

Tables 6 and 7 show that significant differences were found between the two study areas in the incidence rates for cardiovascular abnormalities and the prevalence rates for abnormal white blood counts, neutrophiles, and urine albumin.

As was expected, dental fluorosis was observed in Bartlett in all of the participants born and in continuous residence in Bartlett during the tooth formative period. In Cameron, the single individual with dental fluorosis had a history of early fluoride exposure. No new cases appeared in the participants of either area in the 10-year period.

**Table 7B. Prevalence of abnormal laboratory findings, 1943 and 1953**

[Resident and removed participants]

Laboratory determination	Year	Bartlett			Cameron		
		Number examined	Number abnormal	Rate (percent)	Number examined	Number abnormal	Rate (percent)
Hemoglobin.....	1943	116	34	29.3	121	37	30.6
	1953	90	25	27.8	103	30	29.1
Hematocrit.....	1943						
	1953	89	5	5.6	102	8	7.8
Red blood count.....	1943	116	25	21.6	121	24	19.8
	1953	91	6	6.6	103	5	4.9
White blood count.....	1943	116	17	14.7	121	5	4.1
	1953	89	12	13.5	102	13	12.7
Differential count:							
Neutrophiles.....	1943	71	15	28.1	71	6	8.5
	1953	89	25	23.0	102	16	15.7
Lymphocytes.....	1943	71	2	2.8	71	1	1.4
	1953	89	41	46.1	102	46	45.1
Eosinophiles.....	1943	71	0	0.0	71	0	0.0
	1953	89	6	6.7	102	16	15.7
Sedimentation rate.....	1943						
	1953	89	36	40.4	103	24	23.3
Blood calcium.....	1943						
	1953	79	9	11.4	66	7	10.6
Serologic test for syphilis.....	1943	71	2	2.8	71	3	4.2
	1953	89	2	2.2	102	2	2.0
Urine albumin.....	1943	115	3	2.6	121	10	8.3
	1953	90	5	5.6	104	12	11.5
Urine glucose.....	1943	115	2	1.7	121	4	3.3
	1953	90	0	0.0	104	1	0.9

Neither the statistically significant differences nor those that are not significant predominate in either group, except in the case of dental fluorosis. The other significant differences were just above the significance level. These differences were no greater than would be expected in a like study of any two areas similar to Bartlett and Cameron, with or without an excess of fluoride in either water supply.

### Conclusions

The incidence of specific systemic abnormalities and the prevalence of abnormal laboratory findings showed no tendency toward higher or lower rates for either town, except that the number of cases of dental fluorosis was significantly higher in Bartlett than in Cameron and the difference in the rates for cardiovascular

abnormalities reached a significant level in Cameron.

The differences in laboratory findings are recognized to be clinically transient and must be evaluated in terms of clinical circumstances. They do not suggest a pattern of association to fluoride effects.

The difference between the age-corrected death rates in the two study areas is not statistically significant.

No clinically significant physiological or functional effects resulted from prolonged ingestion of water containing excessive fluoride, except for dental fluorosis.

### Summary

A 10-year study of 116 persons in Bartlett and 121 in Cameron, Tex., was conducted to

# Glossary of ranges, standards, and definitions of abnormalities

Determination	Defined range	Reference
<i>Laboratory Findings</i>		
Hemoglobin:		
Male	14-16 mg. percent	(12)
Female	12-14 mg. percent	
Red blood count:		
Male	4.6-6.2 per cu. mm.	(12)
Female	4.2-5.4 per cu. mm.	
White blood count	5,000-10,000 per cu. mm.	(12)
Differential:		
Neutrophils	50-65 percent	(12)
Lymphocytes	25-35 percent	
Monocytes	4-10 percent	
Basophiles	0-2 percent	
Eosinophiles	.5-4 percent	
Abnormal cells	Reported as observed	
Hematocrit:		
Male	40-54 vol. percent	(12)
Female	37-47 vol. percent	
Sedimentation rate (corrected):		
Male	0-9 mm. per hr.	(12)
Female	0-20 mm. per hr.	
Blood calcium	9-11 mg. percent	(13)
Urine:	Reported as observed (qualitative)	
Albumin		
Glucose		
<i>Clinical Abnormalities</i>		
Blood pressure:		
Maximum normal for study	150/99	(14)
Systolic hypertension	151 mm. Hg and over	
Diastolic hypertension	100 mm. Hg and over	
Abnormal pulse pressure in presence or absence of hypertension.	75 mm. Hg or greater	
Cardiovascular	Presence of arteriosclerosis alone or with decompensation, diastolic murmurs, abnormal pulse pressure, aneurysms, heart block, or other abnormal cardiac findings, including hypertension. (For the purpose of the study, hypertension alone is recorded as an abnormality of blood pressure.)	(14)
Thyroid	When grossly enlarged or palpable. When nodules are present, regardless of size, recorded with tumors and/or cysts.	
Eyes	Cataract and/or lenticular opacity, recorded as observed. Opacity or cataract which developed in second eye since examination in 1943 is designated as 1 person, but as an increase.	
Ears	Air conduction or bone conduction decreased auditory acuity, but not deafness. Decreased acuity associated with excess cerumen alone not included.	
Gallbladder	Gallstones only when demonstrated by X-ray.	
Renal calculi	Renal calculi when demonstrated by X-ray, history of calculi with urine positive for red and white cells, surgical removal, or passage of calculi. (Red blood cells in urine of young females not considered abnormal without supporting CVA tenderness, X-ray, or other positive evidence.)	
Prostate	Nodular prostate recorded with tumors and/or cysts.	
Dental fluorosis (mottled enamel)	Presence of very mild through severe fluorosis as determined by Dean's criteria.	(15)
Other physical examination findings	Recorded as observed.	
<i>X-ray</i>		
Bone	For purpose of the study, X-rays of the lumbar spine, sacrum, pelvis, trochanters, and proximal third of the femurs are used for comparisons.	
Hypertrophic bone change	When alone or in combination with bone spurs.	
Increased bone density	When alone or in combination with coarse trabeculation.	
Coarse trabeculation	When alone and not in combination with increased bone density.	
Other bone changes:		
Fractures	Recorded as observed.	
Osteoporosis	Recorded as observed.	
Spurs	When not associated with hypertrophic change.	

determine if prolonged exposure to fluoride in the water supply of Bartlett had produced detectable physiological effects.

Bartlett's water contained about 8 p.p.m. F until 1952, when an experimental defluoridation unit was installed, reducing the fluoride content to approximately 1.2 p.p.m. F. Cameron was the control area with 0.4 p.p.m. F in its water supply.

The participants, aged 15 to 68 in 1943, were chosen at random from persons who had resided in the respective communities for at least 15 years. The average length of fluoride exposure in 1953 was 36.7 years.

In 1943, the investigators took medical histories and gave each participant a medical, X-ray, and dental examination. In 1953, this procedure was repeated for all the original participants, except the 18 deceased and 10 of the 47 persons who had moved away from the 2 towns.

No significant differences between the findings in the two towns were observed, except for a slightly higher rate of cardiovascular abnormalities in Cameron and a marked predominance of dental fluorosis in Bartlett.

#### ACKNOWLEDGMENT

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#### REFERENCES

- (1) McClure, F. J.: Nondental physiological effects of trace quantities of fluorine. *In* Dental caries

and fluorine, by the American Association for the Advancement of Science. Washington, D. C., The Association, 1946, pp. 74-92.

- (2) Roholm, K.: Fluorine intoxication. A clinical hygienic study. London, H. K. Lewis, 1937.
- (3) Ockerse, T.: Endemic fluorosis in the Pretoria District. *South African Med. J.* 15: 261-266 (1941).
- (4) Møller, P. F., and Gudjonsson, S. V.: Massive fluorosis of bones and ligaments. *Acta Radiol.* 13: 269 (1932).
- (5) Maier, F. J.: Defluoridation of municipal water supplies. *Am. Water Works A. J.* 45: 879-888 (1953).
- (6) Evolve, E.: Estimation of fluorides in waters. *Pub. Health Rep.* 48: 1219-1222 (1933).
- (7) McClure, F. J.: Microdetermination of fluorine by thorium nitrate titration. *Indust. and Engin. Chem., Analyt. Ed.* 11: 171 (1939).
- (8) Benedict, S. R., and Theis, R. C.: A modification of the molybdic method for the determination of inorganic phosphorus in serum. *J. Biol. Chem.* 61: 63-66 (1924).
- (9) U. S. Bureau of the Census: Census of population: 1940. A report of the sixteenth decennial census of the United States. Washington, D. C., U. S. Government Printing Office, 1942.
- (10) U. S. Bureau of the Census: Census of population: 1950. A report of the seventeenth decennial census of the United States. Washington, D. C., U. S. Government Printing Office, 1952.
- (11) Kendall, M. G.: The advanced theory of statistics. Ed. 3. New York and London, Hafner Publishing Company, 1945.
- (12) Wintrobe, M.: Clinical hematology. Ed. 3. Philadelphia, Lea and Febiger Company, 1951.
- (13) Kleiner, I. S.: Human biochemistry. Ed. 3. St. Louis, C. V. Mosby Company, 1951.
- (14) Shaffer, C. F., and Chapman, D. W.: Correlative cardiology. An integration of cardiac function and the management of cardiac disease. Philadelphia, W. B. Saunders and Company, 1952.
- (15) Dean, H. T.: The investigation of physiological effects by the epidemiological method. *In* Fluorine and dental health, edited by F. R. Moulton. Washington, D. C., American Association for the Advancement of Science, 1942, pp. 23-31.

PHR



*Data from birth certificates, particularly the date of the first serologic test for syphilis, indicating commencement of prenatal care, can be a valuable guide to local health officers in focusing prenatal care programs and services to areas of greatest need.*

## Prenatal Care in New York City, 1951

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MANY QUALITATIVE and quantitative factors must be studied in the assessment of maternity care. The date of commencement of prenatal care is one such factor. Although evidence of prenatal care does not guarantee its quality, if no prenatal care is received, or if it is not begun until late in pregnancy, its inadequacy according to accepted standards is beyond question.

In recent years, a query as to the date of the first visit to a physician during pregnancy has been added to the birth certificate in some areas. If this information is reliably recorded, it may

be used, in conjunction with other data from the birth certificate, as a basis for administrative studies of certain problems in the provision of prenatal care. Birth certificates may also be used as a point of departure for the collection of data by direct interview.

Comparatively few investigations of the time of the first prenatal visit to a physician have been made. In 1939, Goddard and Palmer (1) showed that 21 percent of maternity patients in Michigan had begun prenatal care only in the third trimester, or had had no prenatal care, or an unknown amount. The proportion in the same category of "late or no care" among the poorest group of patients (relief group) was 43.2 percent, and among the nonrelief group, 25.6 percent. This report, and a later one by Goddard (2) showed that poor levels of maternity care were found in low-income groups, in the groups with little education, in towns of 10,000 to 100,000 population (rather than the larger cities or smaller towns), and among patients in the later rather than in the first pregnancies.

The comprehensive British study of maternity care based upon interviews carried out in 1946 (3) showed that 10.9 percent of the wives of professional and salaried workers did not

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come under prenatal supervision prior to the third trimester of pregnancy, as compared to 17.8 percent of the wives of manual workers and 19 percent of the wives of agricultural workers. A point of importance in this study is that 47.2 percent of unmarried expectant mothers failed to begin prenatal care prior to the third trimester. As in other investigations, the group in their first pregnancy included a smaller percentage with late commencement of care than the groups in subsequent pregnancies.

Studies of the period of pregnancy in which prenatal care is begun have also been made among special groups. Fiumara (4) and others found that 16.8 percent of the women admitted to the maternity service of the Boston City Hospital had had no prenatal care. Among 679 patients who had received a prenatal serologic test for syphilis, the test was not performed prior to the third trimester in 351 (51.7 percent).

The purpose of the present report is to give data from New York City on the following five questions:

1. How many and what proportion of maternity patients, whose pregnancies terminate in live births, are in the "late care group"?
2. Where do these patients reside?
3. Where are they delivered?
4. Is the rate of late care influenced by race and ethnic group, age, parity, and previous fetal loss?
5. What are the number of cases and the rate of late care among patients whose pregnancies terminate in fetal death?

## Material

All of the birth certificates received on the first working Wednesday of each month in New York City in the year 1951 were selected as a sample from the total of 162,755 live births and 17,961 fetal deaths reported during the year. These birth certificates were distributed as follows:

Total births in 1951 sample.....	8,894
Resident live births.....	7,770
Nonresident live births.....	426
Resident fetal deaths.....	666
Nonresident fetal deaths.....	32

Unmarried mothers were included in the study. From earlier studies, it is known that in New York City approximately 20 percent of non-white children and 2 percent of white children are born out of wedlock.

In 1951, a new birth certificate was introduced which asked for the date of the first prenatal visit as well as for the date of the serologic test for syphilis (STS), which had been requested on the old certificate. The items requesting this information on the new certificate were:

- "22. Date of 1st prenatal visit.....  
 "24. Was serological test for syphilis done during  
 THIS pregnancy or at delivery?.....  
 Date..... Result....."

Both types of certificates were included in this study.

The period of prenatal care as shown by the first visit to a physician is usually longer than that shown by the date of STS because, for example, some physicians do not give an STS

**Table 1. Date of first visit and of serologic test for syphilis, resident live births, New York City, 1951**

Date of STS	Date of first visit						
	First trimester	Second trimester	Third trimester	No visit	Old certificate	Unknown	Total
First trimester.....	1,729	30	9	7	771	109	2,655
Second trimester.....	472	1,154	20	15	950	133	2,744
Third trimester.....	131	82	332	10	235	28	818
No test.....	5	4	1	17	27	19	73
At delivery.....	15	21	46	187	173	74	516
Unknown.....	232	59	15	12	532	114	964
Total.....	2,584	1,350	423	248	2,688	477	7,770

**Table 2. Patients with "late or no serologic test for syphilis" by health district, New York City, 1951**

Health district	Live births	Late or no STS		Health district	Live births	Late or no STS	
		Number	Percent			Number	Percent
Central Harlem <sup>1</sup>	261	124	47.5	Corona	181	25	13.8
East Harlem <sup>1</sup>	268	119	44.4	Astoria	200	27	13.5
Riverside	239	87	36.4	Westchester	185	25	13.5
Bedford <sup>1</sup>	293	95	32.4	Brownsville	240	28	11.7
Lower East Side	375	103	27.5	Sunset Park	185	21	11.4
Mott Haven <sup>1</sup>	264	70	26.5	Maspeth Forest Hills	202	22	10.9
Williamsburg-Greenpoint	185	48	25.9	Tremont	211	22	10.4
Red Hook Gowanus <sup>1</sup>	140	36	25.7	Flatbush	351	36	10.3
Morrisania <sup>1</sup>	315	78	24.8	Bay Ridge	283	26	9.2
Fort Greene	231	57	24.7	Pelham	120	11	9.2
Kips Bay-Yorkville	134	32	23.9	Flushing	292	26	8.9
Lower West Side	249	57	22.9	Graves End	222	19	8.6
Bushwick	203	45	22.2	Fordham	156	10	6.4
Washington Heights	230	48	20.9	Residence unknown	36	17	-----
Jamaica East	209	37	18.7				
St. George and Tottenville	116	19	16.4				
Jamaica West	230	35	15.2	All health districts	6,806	1,407	20.7

<sup>1</sup> Poorer socioeconomic districts.

on the initial visit, and because of any error in approximation of the month of pregnancy. The month of pregnancy, of "first visit," and of STS are approximated by coders from month of birth, reported period of gestation, actual month of first visit, and actual month of STS.

In order to determine which item of information to use to define the late-care group, the date of the first visit was tabulated against the date of the STS for the 7,770 resident live births in the sample (table 1). To test the validity of the sample, annual figures were compared with the figures for the sample, by district and for all 1951 data. Comparisons were made for STS, first visit, and for age and race, and the agreement was remarkably good for all areas tested.

Table 1 shows that the date of STS was known on 6,806 of the 7,770 births, whereas date of first visit was available on only 4,605. Because of this and because there was reasonably good agreement between the items when both were known (that is, on the new certificate), the decision was made to determine the beginning of prenatal care on the basis of the date of the STS. In New York City, a serologic test for syphilis is required by law. The rate of "late or no STS" is defined as the percentage of births for whom the STS was not done or was performed in the third trimester or at de-

livery and this rate will be used as the measure of the rate of late care. The rate for this sample of resident live births was 20.7 percent (1,407/6,806).

#### Geographic Area of Residence

In New York City as a whole, approximately one-fifth of all women whose pregnancies terminated in live births were in the "late or no STS" group.

The proportion of "late or no STS" ranged from 47.5 percent in Central Harlem to 6.4 percent in Fordham (table 2). Of the 30 health districts, 14 exceeded the city average rate. Approximately 70 percent of the "late or no STS" group resided in these 14 districts, and nearly half were concentrated in 7 health districts. The geographic concentration of the districts with the higher rates is shown in the map.

#### Place of Delivery

Striking differences in the rates of "late or no STS" exist among patients in each of the four types of hospital service (table 3). Very high rates in the municipal hospitals contrast with intermediate rates for general service patients in the voluntary hospitals and low rates among

**Table 3. Patients with "late or no serologic test for syphilis" by type of hospital control, New York City, 1951**

Race, age, and parity	Type of hospital					
	Municipal			Voluntary		
	Live births	Late or no STS		Live births	General service	
		Number	Percent		Late or no STS	
					Number	Percent
Total .....	1, 376	642	46. 7	1, 164	324	27. 8
Race:						
White (non-Puerto Rican) .....	346	164	47. 4	665	159	23. 9
Puerto Rican .....	348	170	48. 9	143	52	36. 4
Nonwhite .....	682	308	45. 2	356	113	44. 1
Age:						
Under 20 years .....	219	112	51. 1	126	44	34. 9
20-29 years .....	823	377	45. 8	703	203	28. 9
30 and over .....	334	153	45. 8	335	77	23. 0
Parity:						
Primiparous .....	369	163	44. 2	362	116	32. 0
Multiparous .....	1, 007	479	47. 6	802	208	25. 9
Without previous fetal death .....	774	378	48. 8	660	171	25. 9
With previous fetal death .....	223	101	43. 3	142	37	26. 1

Race, age, and parity	Type of hospital—Continued					
	Voluntary—Continued			Proprietary		
	Private service			Live births	Late or no STS	
	Live births	Late or no STS			Number	Percent
		Number	Percent			
Total .....	2, 795	231	8. 3	1, 229	111	9. 0
Race:						
White (non-Puerto Rican) .....	2, 706	215	7. 9	1, 188	101	8. 5
Puerto Rican .....	26	5	19. 2	4	1	-----
Nonwhite .....	63	11	17. 5	37	9	24. 3
Age:						
Under 20 years .....	64	6	9. 4	31	6	19. 4
20-29 years .....	1, 744	140	8. 0	774	65	8. 4
30 and over .....	987	85	8. 6	424	40	9. 4
Parity:						
Primiparous .....	1, 154	76	6. 6	489	33	6. 7
Multiparous .....	1, 641	155	9. 5	740	78	10. 5
Without previous fetal death .....	1, 306	126	9. 6	607	66	10. 9
With previous fetal death .....	335	29	8. 7	133	12	9. 0



## Antepartum care

New York City, 1951

By health district

Percent late or no STS

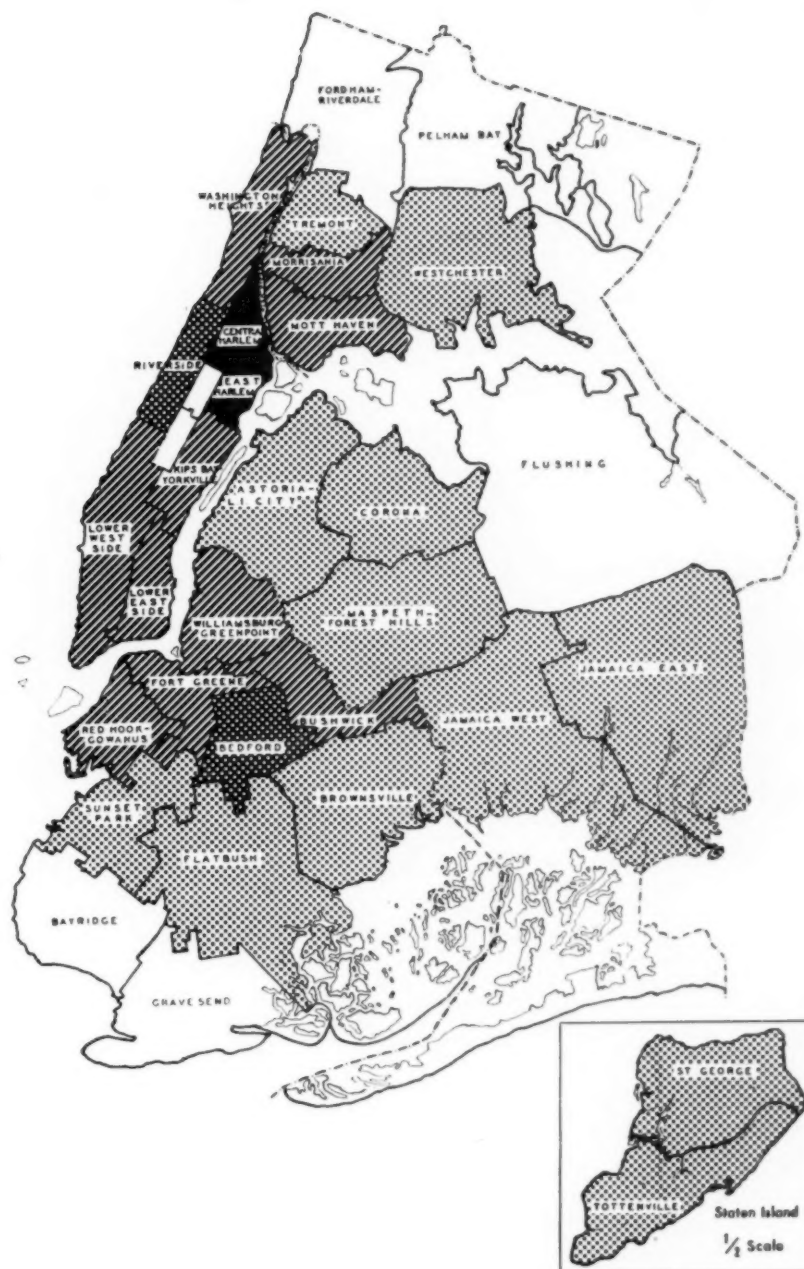
40 and over

30-39

20-29

10-19

less than 10



private patients in voluntary hospitals and in proprietary hospitals.

Data on race, age, and parity are tabulated by hospital type and are also shown in table 3. The table includes data on only 6,564 of the 6,806 live births in the sample on which the date of STS was known. Of the remainder, 97 births occurred at home, 99 in Federal or State hospitals, and on 46, some of the necessary items of information were not available.

## Race and Ethnic Group

Municipal hospital rates for "late or no STS" groups show little difference among nonwhite women, white women of Puerto Rican nativity, and white women of other nativity (table 3). All three groups have high rates. In voluntary hospitals, however, among general service patients, both Puerto Rican and nonwhite patients have higher rates of "late or no STS" than do white patients. However, white patients on

**Table 4. Number and percentage composition of live births, by age and hospital type, New York City, 1951**

Age	Type of hospital									
	Municipal		Voluntary				Proprietary		Total	
			General service		Private service					
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Under 20 years	219	49.8	126	28.6	64	14.5	31	7.0	440	99.9
20-29 years	823	20.4	703	17.4	1,744	43.1	774	19.1	4,044	100.0
30 years and over	334	16.1	335	16.1	987	47.5	424	20.4	2,080	100.1
Total	1,376	21.0	1,164	17.7	2,795	42.6	1,229	18.7	6,564	100.0

general service have conspicuously higher rates than white private patients. The numbers of Puerto Rican and nonwhite patients in private services are too small to permit comparison with white non-Puerto Rican patients.

#### Age

"Late or no STS" rates for patients under 20 years of age were compared with those for patients 20-29 years of age, and with the rates for patients 30 years and over (table 3). Within each hospital group there is little difference in the rate of "late or no STS" by age, although it may be noted that patients under 20 years of age have somewhat higher rates in each of the hospital groups. The difference is somewhat more marked among patients on voluntary general hospital services.

However, maternity patients under 20 years of age are predominantly delivered in the municipal hospitals or in the general service of the voluntary hospitals, where 78.4 percent of live births to mothers under 20 years of age occur (table 4). Because of the high rates of "late or no STS" characteristic of these hospital groups, the proportion of patients under 20 years of age is approximately twice as high in the "late or no STS" group as in the live births in general (table 5).

#### Parity

In municipal and voluntary hospital general service groups, there is practically no difference

in the rate of "late or no STS" for primiparous and multiparous patients (table 3). In the private services, however, the multiparous patients appeared to have slightly higher rates of "late or no STS." The data have not been studied by individual birth orders.

Multiparous patients who had had a previous pregnancy terminating in a fetal death show practically no difference in their rate of "late or no STS" from multiparous patients with no history of a fetal death, when compared within each hospital group. The same is true when the age groups (with sufficient numbers of cases) are separately compared.

#### Fetal Deaths

There were 82 patients in the sample whose pregnancies resulted in fetal death of 28 weeks' gestation or more. For two-thirds of these

**Table 5. Number and percentage composition of live births and of "late or no serologic test for syphilis," by age, New York City, 1951**

Age	Live births		Late or no STS	
	Num- ber	Per- cent	Num- ber	Per- cent
Under 20 years.....	440	6.7	168	12.9
20-29 years.....	4,044	61.6	785	60.0
30 years and over....	2,080	31.7	355	27.1
Total.....	6,564	100.0	1,308	100.0

patients the STS was reported in the third trimester or at delivery in contrast to approximately one-fifth for patients whose pregnancies terminated in live births. The total number of fetal deaths at 28 weeks or more gestation was too small to permit any further analysis (table 6).

## Discussion

In this study, neither race nor ethnic group nor the three broad age bands as such appear to have any very striking or consistent relationships with the rate of "late or no STS." However, patients under 20 years of age, nonwhite patients, and those of Puerto Rican nativity are found in large proportions among those groups which are in general characterized by high rates of "late or no STS."

Parity, on the other hand, as such, has no relationship to the rate of "late or no STS" except for a somewhat higher rate among multiparous private patients. It is important to note that patients who had had a previous fetal death do not show lower rates of "late or no STS" than do multiparous patients within the same hospital grouping who had had no previous fetal death, although the former are at much greater risk with respect to subsequent pregnancies.

The widest differences in the rate of "late or no STS" were found when patients were grouped according to the health district in which they resided and according to the type of hospital in which they were delivered. Although health districts are not composed of homogeneous groups of the population, they

**Table 6. Trimester of serologic test for syphilis, and fetal deaths, New York City, 1951**

Trimester of STS	Live births		Fetal deaths at 28 weeks' gestation and over	
	Number	Percent	Number	Percent
First and second trimester-----	5,399	79.3	27	32.9
Third trimester-----	818	12.0	6	7.3
At delivery-----	516	7.6	49	59.8
No test-----	73	1.1	0	0
Total-----	6,806	100.0	82	100.0

**Table 7. Percentages given serologic test for syphilis by date of test, according to type of hospital control, New York City, 1951**

Hospital control	Date of serologic test for syphilis				
	Last trimester	No test	Test at delivery	Total rate of "late or no STS"	Unknown
Municipal-----	16.3	1.3	29.1	46.7	3.5
Voluntary:					
General service-----	20.7	.9	6.2	27.8	6.4
Private service-----	7.6	.4	.3	8.3	14.3
Proprietary-----	7.8	.4	.8	9.0	17.8

differ markedly in economic status and related characteristics of their residents. Groups of patients are similarly distinguished according to whether they are delivered in municipal hospitals, on general services of voluntary hospitals, or as private patients.

In this connection, it should be pointed out that the problems in the types of hospitals may not be quite the same. Table 7 gives the rate of "late or no STS" broken down into its three parts: STS during last trimester, no STS, and STS at delivery. It includes as well the proportion of the total certificates on which no information as to STS was reported.

This information suggests that in the municipal hospitals over half the patients in the "late or no STS" group are being seen for the first time at delivery, whereas in the general services of the voluntary hospitals, most of the patients in this group are seen during the last trimester. The high proportion of unknowns in the private services of the voluntary hospitals and in the proprietary hospitals presumably reflects the quality of the records rather than the quality of the care.

These two factors—place of residence and type of hospital service where the patient was delivered—differentiate social and economic groups in which a large proportion receive a serologic test for syphilis late in pregnancy from groups with a low proportion of late tests. From the public health administrator's point of view, these data indicate that the public health

measures designed to promote earlier care during pregnancy should be heavily concentrated in the selected health districts with the highest rates of "late or no STS" and should be aimed at the groups of patients who may be expected to be delivered in municipal hospitals as the first priority group and in voluntary hospital general services as the second priority group. It seems reasonable to believe that the more the municipal and voluntary hospital outpatient services can be adapted to satisfy in greater measure the human and social needs of patients as well as their medical needs, the greater the possibility will be of influencing pregnant women to begin medical care earlier in pregnancy. Administrative devices should be found which will enable health departments to maintain better contact with groups of patients who are now characterized by high rates of "late or no STS" in order to reach them early in any subsequent pregnancy. Common planning of programs by health departments, hospitals, and social agencies in assuring provision of early prenatal care would be helpful in determining and overcoming the difficulties. Continued, periodic analyses of birth certificate information would provide data on the success of the administrative measures employed.

## Summary

The date of the serologic test for syphilis (STS) during pregnancy was studied in relation to other data available from birth certificates in New York City in 1951. The proportion of late or no STS shows striking differences according to the type of service used in the hospital, the type of hospital where delivery occurred, and residence of the patient. These differences pose concrete and practical questions to the public health administrator.

## REFERENCES

- (1) Goddard, J. C., and Palmer, C.: Maternal services in Michigan, with special reference to economic status. Pub. Health Rep. 54: 825-840 (1939).
- (2) Goddard, J. C.: Medical and nursing services for the maternal cases of the National Health Survey. Pub. Health Bull. No. 264. Washington, D. C., U. S. Government Printing Office, 1941.
- (3) London. Royal College of Obstetricians and Gynecology and Population Investigation Commission: Maternity in Great Britain. London, Oxford University Press, 1948.
- (4) Fiumara, N. J., Fleming, W. L., Downing, J. C., and Good, F. L.: The incidence of prenatal syphilis at the Boston City Hospital. New England J. Med. 247: 48-52 (1952).

## Legal Note on Right of Indians to State Services

Significant in its implications for health services to Indians living on reservations is the case of *Acosta v. San Diego County*, decided July 7, 1954, by the District Court of Appeals for the Fourth District of California (272 P. 2d 92). San Diego County had provided relief, on an emergency basis only, to Indians living on the Pala Indian Reservation, but it refused to recognize them as residents of the State entitled to relief under the statute applicable to the relief of the indigent and

incapacitated. The court held that Federal jurisdiction over the reservation is not exclusive and that the Indians are not wards of the Federal Government in the sense that they are not competent to acquire residence in the State. As citizens and residents of the State, they are entitled, under the 14th amendment, to rights and privileges equal to those of other citizens and residents. The plaintiff is accordingly not disqualified by reason of the fact that she is an Indian living on a reservation.



## Promoting Health Careers: A National Project To Alert High Schools

A NATIONWIDE PROJECT directed toward enlarging the pool of health personnel in the United States was formally launched on June 16, 1954. Designated "Operation Health Career Horizons," the project is planned as a major, concerted effort to tell the Nation's young people about career opportunities open to them in all the health professions and services. It is sponsored by the National Health Council, with the public service support of one of the council's sustaining members, the Equitable Life Assurance Society of the United States.

Impetus for the project came from the National Health Council's 1954 National Health Forum, which met in March 1954 to consider changing factors in staffing America's health services. Of the several key factors emerging from that forum, the need for enlarging the national pool of manpower for health services was paramount.

The project will open new recruitment channels by bringing to the 7 million boys and girls in the Nation's high schools information on a wide range of health opportunities. Albert W. Dent, president of the National Health Council, in announcing the project to the council's board of directors, expressed the hope that, through the project's lines of communication, all the health professions and their supporting services would be able to reach more and more candidates.

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*This material was prepared by the National Health Council.*

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### Publications Planned

The primary objective of Operation Health Career Horizons is to reach an audience which includes the young people themselves, their families, their teachers and advisers, and their communities. As its initial step, it will produce three publications and give them national distribution.

The plan for the basic document calls for it to be an attractive, yet concise, all-in-one-package guidebook for teachers and vocational counselors. The challenging word-and-picture presentation will provide two different views of health career opportunities: a wide-angle view of the entire health service field, highlighting its many callings and challenges, its goals and ideals, its personal satisfactions and rewards; and a series of closeups, each covering a specific health career occupation—professional, technical, supporting—giving a compact picture of what each has to offer a young person and where to get more detailed information.

The guidebook will be organized for vocational guidance usage and at the same time it will be written to appeal to the basic interests and motivations of students. Distribution will be primarily to the secondary schools, but also to health agencies, public libraries, and other community resource points.

Supplementing the guidebook will be a brief leaflet for the students and for their parents. This will be prepared for the widest possible general distribution.

The third publication category will be a series of health career posters for school and community use in calling attention to the availability of authentic Health Career Horizons information in every community in the land.

All the materials being planned in this project will be focused on the individual who is considering the selection of his career. They will deal with the personal satisfactions and opportunities for service open to young people embarking upon such careers.

The present timetable for Operation Health

Career Horizons calls for release of the basic guidebook and supporting materials by mid-winter.

#### **Follows Forum Recommendations**

The plan of operation of the project follows in many respects the concrete suggestions made by vocational counselors during the 1954 National Health Forum (1). These suggestions have been summarized as follows:

1. Health groups should produce recruitment materials more adroitly designed to influence and motivate young people to enter health fields.

2. Vocational guidance groups should be consulted on how to keep informative brochures objective and accurate, yet appealing.

3. Health material should be distributed from a central source instead of being, as now, hard to find and get.

4. Material should show the broad range of opportunities in health rather than presenting one or two of the better known areas.

5. Health groups should make greater effort to give young people firsthand contact with health activities through individual conferences with persons actually engaged in the area of interest, more "career day" field visits, and more opportunities to serve as volunteers.

In keeping with the recommendation that vocational guidance groups be consulted, the National Vocational Guidance Association has named an advisory group composed of six of its members. The group will be chaired by Dr. Robert Hoppock, professor of education at New York University.

The advice and guidance of the National Association of Secondary School Principals has also been proffered, and an advisory committee has been set up under the chairmanship of Dr. Harold A. Odell, principal of the Montclair Senior High School, Montclair, N. J. Speak-

ing for the association at the announcement meeting was its 1953-54 president, Dr. Joseph C. McLain, principal of the senior high school at Mamaroneck, N. Y. Others voicing support of the health careers project were Dr. Leona Baumgartner, commissioner of health of New York City, and Ray D. Murphy, president of the Equitable Life Assurance Society.

Subsequent to the announcement of the project, expressions of support and interest have come from all quarters of the fields of health and education and community life. Already, professional health associations are reevaluating their career development and recruitment programs as discussions go forward with the Health Career Horizons project staff to determine the emphasis and content of the guidebook and other publications.

National voluntary health agencies have begun to alert their local units to the problems and opportunities of the project and to consider ways and means of stimulating and following through on local action. A project advisory committee to the executive director of the National Health Council has been set up to assist in policy development for the project. This committee is under the chairmanship of Dr. Franklin M. Foote, executive director of the National Society for the Prevention of Blindness. Some 1,500 local and State health councils throughout the country have been apprised of the project, and a national committee has been formed to aid local health councils in developing programs in the field of health careers. This committee is chaired by Milton Shurr, chairman of the Conference for Health Council Work.

#### **REFERENCE**

- (1) National Health Council: Highlights of the 1954 National Health Forum on "Changing Factors in Staffing America's Health Services." New York. The Council, 1954. Mimeographed.

# Hospital Income and Expense Ratios, 1951

By MARYLAND Y. PENNELL, MARION E. ALTENDERFER, ROBERT M. SIGMOND,  
and ISIDORE ALTMAN

A RECENT ANALYSIS of the income and expense of nonprofit short-term general hospitals in the United States (1) shows that hospital size (in terms of number of beds) is directly associated with the number of services offered by the hospital. The number of different types of services offered is directly associated with expense per patient-day. When expense per patient-day is high, the hospital is most likely to find little surplus left after total expense is deducted from total income.

## Bed Capacity

High per diem expense is an outstanding characteristic of large hospitals. Among the 1,515 hospitals studied, the average per diem expense in 1951 in those with less than 50 beds was

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*Mrs. Pennell and Miss Altenderfer are statisticians in the Division of Public Health Methods, Public Health Service. Mr. Sigmond, administrative assistant, Albert Einstein Medical Center, Philadelphia, was formerly director of fiscal studies of the Commission on Financing of Hospital Care. Dr. Altman, statistician with the United Cerebral Palsy Associations, Inc., New York City, was formerly statistician of the commission.*

*This paper presents information from a study made by the Division of Public Health Methods and the Commission on Financing of Hospital Care, using data provided by the American Hospital Association. It supplements the analysis of variation in income and expense ratios among 1,515 nonprofit short-term general hospitals currently being issued as Public Health Service Publication No. 407.*

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\$14.61 as compared with \$20.67 in those with 250 or more beds. Payroll is the major item of hospital expense, accounting for 52 percent of total expense in the small hospitals and 59 percent in the large ones. The variation in payroll expenditure is explained by the range in the number of personnel in relation to patients, which increases from 145 full-time paid employees per 100 patients per day in the small hospitals to 203 in the large ones. Total income is in excess of total expense for hospitals in each size group, but the percentage of excess is least among the largest hospitals.

Income per patient-day increases with size of hospital, from \$15.49 in the smallest hospitals to \$20.97 in the largest hospitals. Both per diem income from patients and income from all other sources are greatest in the largest hospitals. The proportion of total income that is derived from patients decreases with increased hospital size, to 85 percent of the total in the largest size group.

Occupancy rates of large hospitals tend to be higher than those of small hospitals. The increase in occupancy is from 61 percent in hospitals with less than 50 beds to 79 percent in those with 250 or more beds. The longer average period of hospitalization in the larger institutions—9.4 days in the largest size as compared with 6.1 days in the smallest size—is due in part to the fact that more complicated cases are cared for where specialized facilities and services are available.

## Scope of Program

A close relationship is found between bed capacity and the scope of a hospital's service pro-

gram as measured by the number of different organized services offered. (The product-moment coefficient of correlation between the two variables is +0.74.) The proportion of small hospitals (less than 50 beds) and of large hospitals (250 or more beds) with each of the 19 selected services is shown below:

Service	Small hospitals (Percent)	Large hospitals (Percent)
Diagnostic X-ray.....	88	100
Basal metabolism apparatus.....	73	99
Clinical laboratory.....	73	100
Electrocardiograph.....	67	99
Medical record department.....	51	100
Outpatient department.....	44	90
Blood bank.....	37	92
Medical library.....	23	100
Pharmacy.....	18	99
Physiotherapy department.....	12	91
Routine chest X-ray.....	11	41
Therapeutic X-ray.....	8	97
Dental department.....	5	69
Cancer clinic.....	3	75
Postoperative recovery room.....	3	39
Social service department.....	2	71
Electroencephalograph.....	2	51
Mental hygiene clinic.....	1	40
Occupational therapy department.....	1	40

Because the range of services and the size of hospital are closely related, the several operating ratios vary with scope of program in the same manner as with hospital size. The important characteristics of the hospitals with 14-19 of these selected services, in comparison with the hospitals with 0-5 services, are high occupancy rates, long average duration of patient stay, high per diem expense for payroll and for other items, and a small balance of total income over total expense. The proportion of total expense absorbed by payroll is higher in the hospitals with the largest number of services than in the hospitals with the smallest number of services. The large number of full-time employees in relation to patients in the hospitals with the greatest variety of services is partly due to the different kinds of personnel needed to furnish these services.

The number of services offered determines in large part the cost differentials among hospitals. At one extreme, 36 percent of the hospitals with 0-5 services have a per diem expense of less than

\$12 and 7 percent have an expense of \$20 or more. At the other end of the scale, the corresponding percentages for the hospitals with 14-19 services are 1 and 51. In general, the hospitals which have low per diem costs are those which offer a relatively narrow range of services, although high costs do not in each instance assure the presence of a broad program.

#### Per Diem Expense

Since both scope of program and bed capacity are related to hospital costs, these two characteristics are held constant in analyzing the variation in operating ratios with per diem expense. From the 1,515 hospitals for which financial data are available, 863 hospitals have been selected on the basis of size and services: under 50 beds and 0-5 services, 50-99 beds and 6-9 services, 100-249 beds and 10-13 services, and 250 or more beds and 14-19 services. The operating ratios for four different levels of expense for each of these homogenous groups are shown in table 1.

Among groups of hospitals with similar bed capacity and scope of program, occupancy rate and length of stay vary inversely with expense per patient-day, except in the case of the largest size and service group. Among the small hospitals with 0-5 services, for example, the occupancy rates are lower and the average patient stays are shorter in the more expensive hospitals than in hospitals with lower per diem expense. As would be expected, per diem income both from patients and from other sources is substantially greater among the hospitals with the highest per diem expense. In the high-cost hospitals (except the smallest size and service group) a relatively large proportion of expenditures is absorbed by payroll, reflecting the high ratio of personnel to patients. Per diem income does not increase at as steep a rate as per diem expense, with the result that the high-cost hospitals are least likely to operate with substantial excess of total income over total expense.

The accompanying figure illustrates the variation in four ratios in relation both to per diem expense and to bed capacity and number of services offered. The lowest occupancy and the



**Table 1. Average rates for 863 nonprofit<sup>1</sup> short-term general hospitals, by number of beds and services and expense per patient-day, 1951**

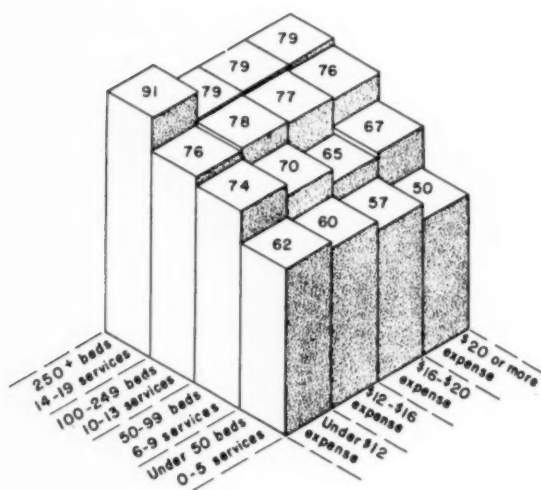
Number of beds and services and expense per patient-day	Number of hos- pitals	Occupancy rate	Average length of stay (days)	Income per patient-day		
				Total	Patient	Patient as percent of total
<i>Under 50 beds and 0-5 services</i>						
Under \$12.00.....	92	61.6	6.9	\$10.75	\$10.15	94.5
\$12.00-\$15.99.....	89	59.9	6.1	14.61	13.71	93.8
\$16.00-\$19.99.....	32	56.6	5.5	18.39	16.51	89.8
\$20.00 or more.....	18	50.3	4.3	23.32	20.71	88.8
<i>50-99 beds and 6-9 services</i>						
Under \$12.00.....	39	74.2	7.6	10.94	10.05	91.9
\$12.00-\$15.99.....	114	70.2	6.9	14.71	13.36	90.8
\$16.00-\$19.99.....	64	65.4	6.3	18.17	16.69	91.9
\$20.00 or more.....	39	67.4	5.7	25.36	23.03	90.8
<i>100-249 beds and 10-13 services</i>						
Under \$12.00.....	6	76.1	7.8	11.11	9.13	82.2
\$12.00-\$15.99.....	75	78.3	7.9	15.05	13.98	92.9
\$16.00-\$19.99.....	81	77.0	7.7	18.79	17.24	91.7
\$20.00 or more.....	77	76.4	7.2	24.23	21.50	88.7
<i>250 or more beds and 14-19 services</i>						
Under \$12.00.....	1	90.6	11.0	11.54	9.75	84.5
\$12.00-\$15.99.....	27	78.9	9.8	14.77	12.90	87.3
\$16.00-\$19.99.....	38	79.1	9.6	18.56	16.14	87.0
\$20.00 or more.....	71	78.8	9.9	25.34	20.50	80.9

Number of beds and services and expense per patient-day	Expense per patient-day			Full-time paid personnel per 100 patients per day	Deficit- surplus as percent of expense
	Total	Payroll	Payroll as percent of total		
<i>Under 50 beds and 0-5 services</i>					
Under \$12.00.....	\$9.75	\$5.28	54.2	114	+10.3
\$12.00-\$15.99.....	13.81	7.34	53.1	139	+5.8
\$16.00-\$19.99.....	17.49	9.51	54.4	166	+5.1
\$20.00 or more.....	23.22	11.77	50.7	208	+4
<i>50-99 beds and 6-9 services</i>					
Under \$12.00.....	9.93	5.19	52.3	125	+10.2
\$12.00-\$15.99.....	14.00	7.81	55.7	153	+5.1
\$16.00-\$19.99.....	17.66	9.72	55.0	171	+2.9
\$20.00 or more.....	24.13	13.66	56.6	212	+5.1
<i>100-249 beds and 10-13 services</i>					
Under \$12.00.....	10.15	4.69	46.1	122	+9.4
\$12.00-\$15.99.....	14.22	7.90	55.6	156	+5.8
\$16.00-\$19.99.....	17.83	10.20	57.2	185	+5.4
\$20.00 or more.....	23.20	13.61	58.7	207	+4.5
<i>250 or more beds and 14-19 services</i>					
Under \$12.00.....	11.87	6.62	55.8	143	-2.8
\$12.00-\$15.99.....	14.48	7.97	55.0	172	+2.0
\$16.00-\$19.99.....	18.18	10.40	57.2	194	+2.1
\$20.00 or more.....	25.47	15.39	60.4	231	-5

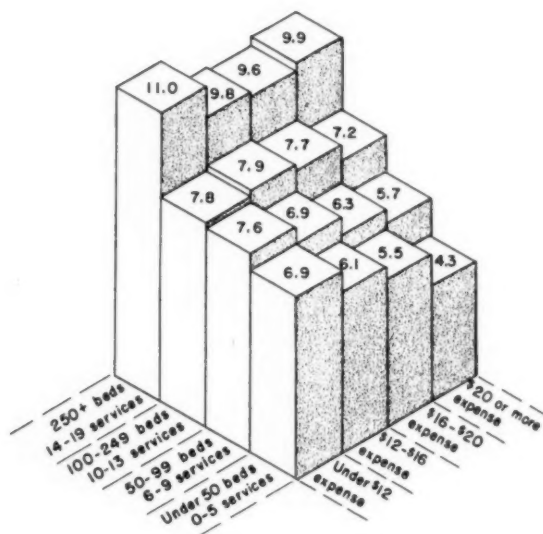
<sup>1</sup> Excludes Catholic and Government hospitals.

**Variation in four ratios with per diem expense and with number of beds and services in 863 non-profit short-term general hospitals, 1951**

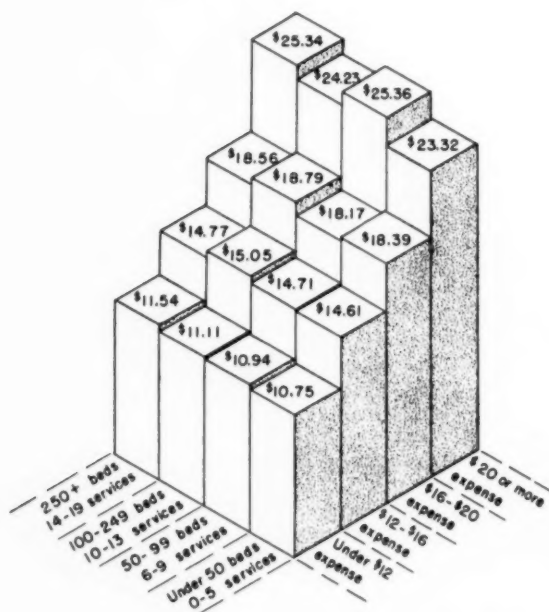
**OCCUPANCY RATE**



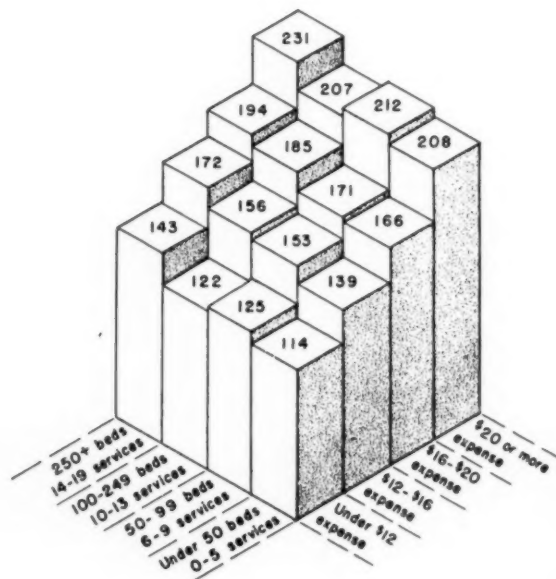
**LENGTH OF STAY**



**TOTAL INCOME PER PATIENT DAY**



**FULL-TIME PAID PERSONNEL PER 100 PATIENTS PER DAY**



shortest stay are found in the high-cost hospitals with less than 50 beds and 0-5 services. The low-cost hospitals in the lowest size and service group have the lowest income per patient-day. These same hospitals have the lowest ratio of personnel to patients.

**Deficit or Surplus**

In 1951 about three-fourths of the hospitals studied were able to finance current operations from current total income and only one-fourth had a deficit. At the extremes, about 1 hospital in 10 reported a deficit of 5 percent or more,

**Table 2. Average rates for 863 nonprofit<sup>1</sup> short-term general hospitals, by number of beds and services and deficit or surplus, 1951**

Number of beds and services and deficit or surplus	Number of hospitals	Occupancy rate	Average length of stay (days)	Income per patient day		
				Total	Patient	Patient as percent of total
<i>Under 50 beds and 0-5 services</i>						
Deficit 5 percent or more.....	22	53.7	6.7	\$12.84	\$11.90	92.6
Deficit 0.1-4.9 percent.....	29	59.8	6.6	13.14	12.10	92.2
Surplus 0-4.9 percent.....	76	60.0	6.2	14.22	13.20	92.9
Surplus 5 percent or more.....	104	60.0	5.9	14.64	13.62	93.0
<i>50-99 beds and 6-9 services</i>						
Deficit 5 percent or more.....	27	65.6	7.1	15.99	14.28	89.3
Deficit 0.1-4.9 percent.....	44	69.3	6.8	15.17	13.51	89.1
Surplus 0-4.9 percent.....	70	71.8	6.9	15.85	14.57	91.9
Surplus 5 percent or more.....	115	68.3	6.3	17.52	16.10	91.9
<i>100-249 beds and 10-13 services</i>						
Deficit 5 percent or more.....	10	67.3	8.3	16.62	15.14	91.1
Deficit 0.1-4.9 percent.....	47	74.2	8.1	19.00	17.30	91.0
Surplus 0-4.9 percent.....	84	78.5	7.4	18.28	16.54	90.5
Surplus 5 percent or more.....	98	78.3	7.5	20.21	18.30	90.6
<i>250 or more beds and 14-19 services</i>						
Deficit 5 percent or more.....	15	74.6	11.6	24.50	17.07	69.7
Deficit 0.1-4.9 percent.....	43	78.0	10.1	21.26	17.26	81.2
Surplus 0-4.9 percent.....	56	81.2	9.4	20.89	18.28	87.5
Surplus 5 percent or more.....	23	79.3	9.1	21.53	18.98	88.2

Number of beds and services and deficit or surplus	Expense per patient-day			Full-time paid personnel per 100 patients per day	Deficit-surplus as percent of expense
	Total	Payroll	Payroll as percent of total		
<i>Under 50 beds and 0-5 services</i>					
Deficit 5 percent or more.....	\$14.64	\$7.48	51.1	144	-12.3
Deficit 0.1-4.9 percent.....	13.48	7.35	54.5	139	-2.5
Surplus 0-4.9 percent.....	13.89	7.36	53.0	137	+2.3
Surplus 5 percent or more.....	12.57	6.76	53.8	136	+16.4
<i>50-99 beds and 6-9 services</i>					
Deficit 5 percent or more.....	17.64	9.43	53.5	164	-9.4
Deficit 0.1-4.9 percent.....	15.42	8.19	53.1	159	-1.6
Surplus 0-4.9 percent.....	15.55	8.71	56.0	158	+1.9
Surplus 5 percent or more.....	15.43	8.70	56.4	163	+13.5
<i>100-249 beds and 10-13 services</i>					
Deficit 5 percent or more.....	18.27	10.68	58.5	196	-9.0
Deficit 0.1-4.9 percent.....	19.33	11.13	57.6	191	-1.7
Surplus 0-4.9 percent.....	17.82	10.16	57.0	176	+2.6
Surplus 5 percent or more.....	18.03	10.30	57.1	179	+12.1
<i>250 or more beds and 14-19 services</i>					
Deficit 5 percent or more.....	26.83	15.45	57.6	244	-8.7
Deficit 0.1-4.9 percent.....	21.54	12.69	58.9	213	-1.3
Surplus 0-4.9 percent.....	20.46	12.26	59.9	204	+2.1
Surplus 5 percent or more.....	19.71	11.51	58.4	191	+9.2

<sup>1</sup> Excludes Catholic and Government hospitals.

while 4 in 10 reported a surplus of 5 percent or more. Deficits are most prevalent among the large hospitals which provide a broad scope of service and therefore have a high expense per patient-day.

The operating ratios are shown in table 2 for four different levels of deficit or surplus for each of the homogeneous groups of hospitals selected on the basis of bed capacity and number of services available. Hospitals with deficits have low occupancy rates in comparison with hospitals of similar size and number of services that have surpluses. Average length of stay, on the other hand, is long in the "deficit" hospitals.

Per diem income from patients tends to be low, both dollarwise and percentagewise, in the hospitals with deficits, while expense is relatively high for both payroll and other items. The low occupancy among the hospitals with deficits accounts in part for their high costs per patient-day and their resulting deficits.

The long average patient stay in this group of hospitals may result from a relatively large proportion of complicated cases with high per diem costs. This in turn may result in large total bills. If such bills are less likely than others to be paid in full, then long stay is consistent with the low per diem income from patients found in the hospitals with deficits.

When bed capacity, number of services, and per diem expense are all held constant, the hospitals incurring a deficit have low occupancy rates, long average patient stay, and low income from patients in comparison with the hospitals with a surplus.

#### REFERENCE

- (1) Pennell, M. Y., Sigmond, R. M., Altman, I., and Altenderfer, M. E.: Income and expense ratios of general hospitals, 1951. Public Health Service Pub. No. 407. Washington, D. C., U. S. Government Printing Office, 1954.

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## National Nurse Week

The first National Nurse Week will be observed October 11-16, 1954. The Department of Health, Education, and Welfare first suggested such a program and, together with the American Nurses Association, supported the joint resolution introduced into the House and Senate last winter and passed August 23, 1954. National Nurse Week will focus public attention and interest on the important contribution of the nursing profession to the health of the Nation.

In active practice in the country today are 391,500 nurses. A little more than 230,000 of these are working in hospitals—a gain of more than 15 percent over 1950. The next largest number of nurses, 80,500, are on private duty; 36,300 are working in doctors' offices, and 25,300 are in the public health field. Industry employs 11,000. Approximately 7,600 are faculty members in schools of nursing.

The American Nurses Association and the National League for Nursing are spearheading the nationwide observance of National Nurse Week. The American Public Health Association, the American Medical Association, the American Hospital Association as well as the nursing services of the Federal agencies and the Red Cross are assisting in the plans. These national associations have sent to their State and local members suggestions for the week's community activities.



# What Price Decibels?

By HARRY A. NELSON

*A Wisconsin official views his State's legislation to compensate for damage to hearing suffered by workers in industry.*

IF NOISE, as so aptly defined, is unwanted sound, it may conservatively be stated that to many of our citizens the subject of industrial loss of hearing belongs in the category of noise.

In nature, noise within the accepted definition is rare, but, in civilization, noise has become increasingly frequent and unpopular, even to the stage of anathema.

That the subject of industrial loss of hearing is a serious one cannot be doubted. We listen to questions about the elimination of noise, protection of hearing, and whether compensation or damages shall be paid to those who have suffered loss because of industrial exposure. We hear estimates that occupational loss of hearing could result in the filing of several billions of dollars in claims.

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The fact that the usually unsuspecting consumer of products must ultimately bear the financial burden of noise does not dispose of the problem of immediate fiscal impact on employers and insurance carriers. They may be faced with payment for loss of hearing accrued over many years and may be unprepared for a liability not anticipated and for which no reserves have been established. Elements of competition between industries in States with different laws create economic quandaries.

## A Complex Problem

Much of the confusion which has arisen as to compensation liability arises because of deviation from original concepts. When compensation laws were first enacted, certain basic principles were recognized. A primary tenet was that benefits were to be based on wage loss. Why do we not measure wage loss as and when it occurs, and award compensation accordingly? Those who are acquainted with workmen's compensation administration recognize the almost insuperable task that a system of that kind would involve. Benefits would vary from week to week and require repeated adjudication. The factors of speed, security, and certainty—implicit in good compensation administration—would be lost.

As a workable scheme for administration of approximate justice, most States have adopted

schedules of fixed benefits. These schedules provide for certain measurable payments based on physical loss. In many cases, they bear little relation to actual wage loss. They leave much to be desired as to meticulous relativity and uniformity, even between items in given schedules.

Why does loss of hearing present such an extreme problem in workmen's compensation? To the informed, the answer is simple. Noise is almost ubiquitous. There are so many possible claimants. Many industrial operations engender noise sufficient in time to cause loss of hearing. Few employees actually lose wages because of their partial deafness. Few, if any, become totally deaf because of prolonged exposure to noise. Difficulties are present as to determination of levels of noise sufficient to cause loss. The cause of the loss is not always easily determinable. The price to be paid for loss to the employee produces much controversy.

There has been a pronounced tendency to deviate from the initial test of wage loss and to award compensation for trivial physical impairment regardless of wage loss. Should amounts so expended and so urgently needed be used instead for benefits to be paid to those who suffer substantial wage loss? The issue must be decided by legislative bodies with the use of such logic and evaluation of contentions as customarily motivate lawmakers in constructing legislation.

### **The Wisconsin Act**

Wisconsin's compensation act (1953 Wis. Stat., ch. 102) included occupational diseases in 1919. Although silicosis is a typical occupational disease, claims based on that disease were not filed in any number until about 1932. More remarkably, only a few stray claims for gradual loss of hearing were filed before 1951.

When the Wisconsin act embraced occupational diseases, apparently it was assumed that they were to be handled in the same manner and with like benefits as were accidental injuries. "Time of injury" was defined as the "date of the accident which caused the injury or the date when the disability from the occupational disease first occurs." Under these provisions,

the court held in claims arising from silicosis that to enforce liability there must be disability during the period of actual employment—disability such as to result in wage loss.

Later, the law was amended (sec. 102.01 (2)) to provide that in the event of disease "time of injury" should be "the last day of work for the last employer whose employment caused disability." This definition was included to protect cases where disability started after the employee had ceased work.

The Wisconsin act included schedules of permanent partial disabilities 2 years after its original enactment and 6 years before the adoption of the occupational disease provision. The present schedule (sec. 102.52) calls for payment of 50 weeks' indemnity for loss of hearing in 1 ear and of 333 $\frac{1}{3}$  weeks' indemnity for total deafness of both ears, which, at the maximum rate, amounts to something over \$12,000. "Relative injury" provisions call for pro rata apportionment when partial deafness results. For 50-percent deafness of both ears, the allowance would be over \$6,000.

When the State of Wisconsin Industrial Commission was faced with a considerable number of claims, it was confronted with some difficult questions: Was it possible to prove that loss was due to noise? Was such loss of hearing an occupational disease? Was it required that there be a "last day of work"? Was wage loss necessary? Did the schedule apply? Could partial loss be measured on a schedule basis?

The commission considered that the schedule, having existed prior to the enactment of the occupational disease law, was read into the law providing coverage for disease and, therefore, was to apply to slowly developing disease as well as to injury by accident. The law made no stated exception as to application of schedules. Was constructive exception to be made in a single type of disability although in all other types the schedule was to be applied?

In silicosis cases, compensation was usually based on disability such as to cause wage loss. In those cases, the court had held that to find liability, there must be wage loss and not merely so-called medical disability. There was no schedule which applied to the body as it did to members of the body, although a more recent court construction now in effect has so held.

The court had not been faced with a situation in which occupational disease without wage loss had produced a disability which, if caused by accident, clearly was to be compensated for under the schedule regardless of wage loss.

### A Test Case

The test under the Wisconsin act is that of reasonable probability rather than either possibility or certainty. In the 1951 test case decided by the industrial commission, the testimony clearly established that noise can and does result in loss of hearing and that the employee had worked in noise of a kind and over a sufficient period to result in loss, some of which was permanent. A so-called fatigue loss coexisted from which some recovery might result. Noise was established as the cause of loss of hearing. The claimant suffered from an occupational disease not resulting from a single trauma but from innumerable impacts of energy. The claim was not barred by the statute of limitations since it was found that the claim was made within 2 years from the "last day of work."

The commission further decided that there should be a reduction in the recorded percentage of loss because of hearing loss common at the age (60) of the claimant. The testimony established that the average loss at age 60 was 7.07 percent. Although some restoration of hearing might be anticipated, at the most it could not amount to more than 25 percent, leaving 75 percent as clearly caused by work exposure.

In determination of loss, the American Medical Association method (1) with the use of the pure tone audiometer was found to be the most reliable evolved to the date of decision. Under the Wisconsin statute (sec. 102.52 (17) and (18)), the value of the "second" ear is considered to be  $5\frac{2}{3}$  times the value of the "first" ear. Therefore, in the test case the smaller loss was computed, multiplied by  $5\frac{2}{3}$ , added to the greater loss, and the total was divided by  $6\frac{2}{3}$ . After further deduction as required by the statute (sec. 102.53 (2)) because the claimant's age was over 50, the final result called for payment of 13.511 percent of binaural loss, or 45.04 weeks of compensation, in the sum of \$1,575.46.

Upon appeal of the test case, the Circuit

Court of Dane County, Wis., reversed the commission's order, holding that there was no "last day of work" because the employee was still in service and that wage loss must be shown before compensation could be paid in occupational disease. It stated that the schedule did not apply. The court commented that the case before it was new and novel and not foreseen or anticipated. It made no attempt to exercise the judicial ingenuity which the Supreme Court of Wisconsin had invoked in silicosis cases.

The Supreme Court of Wisconsin on October 6, 1953, in *Green Bay Drop Forge Co. v. Industrial Commission* (265 Wis. 38), upheld the findings of the commission and reversed the decision of the circuit court. It held that wage loss was not necessary to establish a claim for loss of hearing by prolonged exposure to noise; that the schedule applied; that the "last day of work" provision applied only in cases where an employee had actually quit his work; and that the commission had properly fixed the day before the filing of application as the date for liability. It further held that termination of employment was not a condition precedent to establishment of claim; that loss of hearing was disability within the purview of the statute; and that such cases were compensable. On rehearing of the case, the court reiterated its decision.

### The Proposed Formula

For many years, the Wisconsin commission has maintained an advisory committee on workmen's compensation legislation. This committee is composed of representatives of industry, labor, and insurance carriers. When unanimous agreement is reached as to proposed changes, the changes are usually adopted by the legislature.

The committee considered the subject of occupational loss of hearing and felt that because of uncertainty as to legal and economic results at least temporarily a change in law was desirable. The legislature agreed, and effective July 1, 1953 (1953 Laws of Wis., ch. 328, sec. 13), abrogated the schedule as to loss of hearing from prolonged exposure to noise but retained it as to accidental loss. It provided that under the amendment an employee must establish that



he has loss of hearing as a result of prolonged exposure to noise in a given employer's service for a total period of at least 90 days; that because of his loss he has been discharged or transferred from employment; or that he has ceased such employment since it is inadvisable for him to continue in it because of impairment of hearing. If he can then establish wage loss, he may receive benefits not to exceed \$3,500.

To discourage unnecessary discharge or transfer, the employer in such cases, as in the case of a similar provision covering nondisabling silicosis, is charged with uninsurable primary liability.

The advisory committee requested the industrial commission to study and evolve a formula for determination of loss. There was thought that the present formula of the American Medical Association is not realistic, particularly in that it gives undue credibility to the ability to hear sounds outside the range of conversation. A medical subcommittee was then appointed by the advisory committee. The subcommittee recommended that sound below 90 decibels, as measured on a C scale of an approved sound level meter, should not be considered hazardous regardless of the length of exposure.

The subcommittee also recommended a proposed formula for determination of hearing loss. These recommendations are based upon the best scientific information now available, subject to revision as additional information accumulates. The formula, which the advisory committee is now studying to determine whether it should be recommended for use by the commission, provides that—

Pure tone air conduction audiometric tests are to be used in evaluating hearing acuity only in the 3 readings of 500, 1,000, and 2,000 cycles. These are the frequencies ordinarily produced in speech conversation. (The American Medical Association table also includes the frequency of 4,000.) Frequencies between 250 and 8,000 cycles are to be used for diagnostic purposes.

To get the average decibel loss, losses in the 3 frequencies are to be divided by 3. Losses averaging 16 decibels or less are to be held not to constitute hearing disability, and losses of 80 decibels and over are to constitute total deafness. Between these points, each average deci-

bel loss between 17 and 79 is prescribed a percentage of compensable hearing loss.

For binaural loss (both ears), the statutory formula is to be used with the recommendation that for purposes of legislation the relative value of loss as between 1 and both ears should be as 1 to 5.

Loss for presbycusis (age deafness) is to be subtracted at the rate of one-half percent at age 50, plus an additional one-half percent for each year thereafter. Some recovery of hearing may be expected after removal from a noisy environment. Just how much will depend on factors of years of exposure, degrees of loss, and individual susceptibility. A first examination for hearing loss should be made after 48 hours' removal from the noise environment followed by closely spaced periodic tests. Five decibels are to be deducted from each of the average ratings of the 500, 1,000, and 2,000 frequencies to allow for the "recovery factor." The result will be the final permanent loss except for those individuals who have been removed from noise for 6 months or longer.

#### **Good Working Environments**

How many employees will be discharged from their jobs or transferred to others because of loss of hearing? How many can show that it is inadvisable for them to continue because of existing partial deafness?

Certainly employers will not discharge, at great expense, skilled workers because of partial deafness. Employees will not be inclined to quit their jobs even though some loss has resulted and further loss may occur. One purpose of the Wisconsin law, retention of the employee at his work, probably would have been accomplished even without the July 1, 1953, amendment.

The Wisconsin Industrial Commission has before it approximately 530 loss-of-hearing cases for determination. Most of these were filed before July 1, 1953. Some were filed after July 1, claiming loss before July 1. There will have to be determination as to whether the amendment of July 1 blots out these claims or whether claim may still be made provided loss can be established as existing before July 1, 1953.



Other questions may still have to be determined by the Wisconsin Supreme Court. Liability of successive employers was not involved in the 1951 test case previously cited, so that a case on that point probably will go to the State supreme court on appeal. Whether any particular day must be taken as the date of "injury," in view of the statutory provision as to the "last day of work," must definitely be determined. That date involves the questions of wage basis and age of the injured, both of which bear on the amount of liability. What will be decided in a case where definite loss has been measured as of a given date following which there was subsequent employment entailing exposure to damaging noise? Shall the last employer who contributed to loss assume the entire liability, as has been held under somewhat different factors in silicosis cases? The question of operation of statutes of limitations is still to be clarified.

What about future legislation? The commission's advisory committee is continuing to study the subject with a view to new proposals for legislation. The basic question is whether loss of hearing shall be compensated strictly for wage loss or whether some schedule shall again be adopted.

Employers should use all possible diligence in surveying conditions of operation, ascertaining whether detrimental noise is present, and eliminating as much of that noise as possible. Engineers have made many suggestions as to redesign, repair, and maintenance of machinery and equipment, and application of acoustical materials. Segregation of noisy operations has eliminated the noise hazard for some employees. The first line of defense calls for the use of ear defenders or plugs until better or more positive methods can be adopted.

Labor will need to cooperate in making use

of all safety devices and rules adopted. When a claim is made, an employee should be able to establish that loss was present at a given time, and employers should, as a matter of defense, be able to establish cause and extent of loss at the start of, and during, employment. Physical examinations for loss of hearing are vital both from the standpoint of safety and compensation; they should be made promptly and periodically. Is it possible to detect susceptibility of employees to noise? If so, especially susceptible employees should be protected or transferred to employment where the hazard of noise is not a factor.

Regardless of the basis of recovery, workers are rightfully going to insist that they be provided with working environments which will, within reasonably attainable bounds, eliminate the offending hazard. They are entitled to work in environments which will assure retention of their faculties as long as possible.

Codes and standards of safe practice can be written into law only when it is certain that they can be established as physically and economically feasible of attainment and can be accomplished on the basis of sound engineering and safety principles.

Because of the impact of safety codes and compensation laws, silicosis, lead poisoning, and other occupational diseases have been largely eradicated in some States. It is not too much to expect that loss of hearing resulting from industrial noise may be at least greatly reduced and that the ingenuity of science will in time achieve victory in the battle of noise.

#### REFERENCE

- (1) Tentative standard procedure for evaluating the percentage loss of hearing in medicolegal cases. [Report of Council on Physical Medicine.] J. A. M. A. 133: 396-397 (Feb. 8, 1947).

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*"The consequences of authoritarian atmosphere upon the beneficiaries of health education compel us to pay special attention to the personality of the health educator . . ."*

## Mental Health Implications Of Health Education

By JAAP KOEKEBAKKER, M.D.

HEALTH EDUCATION in its most usual form today concentrates on changing accepted patterns of behavior to those intended to bring about the best possible state of physical well-being. In so doing, health education may be classified along with the various other educational sciences, each of which in its own domain endeavors to impart knowledge and offers practical methods to individuals or groups of individuals. Although, in many other educational fields, methods and principles are more or less well defined, a good deal of doubt exists as to what should be taught with regard to health education, as well as to how it should be taught. In this respect, health education is nearest to general education, which too cannot boast of a great measure of unanimity as regards the "what" and the "how." Whereas at an earlier stage, the educator knew pretty well at what age a child should be taught his manners and acted with the full conviction that rigid discipline was the best method, parents today are more hesitant. In general, they prefer to awaken the correct attitude in the child and leave specified behavior to natural development.

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In health education, there can be observed a comparable difference of accent. Concrete knowledge of health and hygiene is considered less important than imparting insight, rousing interest, and fostering values with which man in given situations can achieve a healthy way of living. Hence, in the opinion of many, health education cannot be considered apart from general education for either children or for adults. This interdependence of health education and general education offers advantages in that methods and techniques may be developed in either field but may be applicable in the other. For example, we see the health educator successfully employ educational methods developed in school education. On the other hand, the teacher of biology learns how to find points of contact with a center of interest such as health, and from that he can evoke a wider interest in the processes of nature.

### Integration of Concepts

A disadvantage in this process of integration, however, is that the borderline of health education becomes vaguer. Apparently the value "health" offers a lead for what may or may not be taken as belonging to the domain of health education. On further consideration, however, it appears that this "value area" may not only consist of various subvalues but may also have another place in the total value system and have a quite different place in the order of values. This becomes clear when the

opinions of groups within a certain pattern of culture are compared. For some groups, health is what may be called a primary value. This holds especially true for sport enthusiasts. In the same way, for certain groups of parents, for example, the health of their children is of paramount concern. For others, health is more of a secondary value, and its importance is considered in the light of other fundamental values, such as religion or esthetics.

The differences in appreciation of health in diverse patterns of culture are also well known. The opinions of Brahmins and of Christians are widely divergent in this respect. In so-called primitive cultures, certain illnesses and anomalies of the body may even be a positive asset and may stamp the sufferer as possessing divine power. It should be borne in mind, moreover, that health and the subvalues connected with health, such as good appearance, food, vigor, and the like, not only form a part of an emotionally colored value system, but also form part of widely divergent theories of life.

Too often, there is an inclination to think that nonmedical circles have no notion whatsoever of the life processes and bodily functions that determine health and illness. However, practically every culture—even the primitive cultures—has its own theories in this connection (1). The subjective security which such theories provide is perhaps greater than the security offered by the more relativistic attitude of intellectual man who has grown up surrounded by the facts of modern science. The magical systems that provide these securities are found not only in the so-called underdeveloped areas, but also among large groups in western society. And most individuals build their own concepts of life on these magical systems. For example, they firmly believe that taking three mouthfuls of water after cleansing their teeth, sleeping on a special side, and following many other rituals will exercise a direct influence on their health. What appears to be ignorance is, in the majority of cases, a system of fallacies difficult to eradicate.

The health educator who thinks that ignorant souls thirsting after knowledge will be glad to accept the views he holds on medical science is a priori doomed to repeated failure. He underestimates the forces that maintain the

conceptual processes connected with magic thinking about health which is at work in children and adults, in primitive, nonwestern, and western cultures. Nor will the health educator be able to understand the anxieties every individual experiences when confronting other ideas which threaten to shatter his own cherished outlook on life and the world. A field of problems is thus opened in which mental health comes into play. Only when the new system of certainties which health education tries to change forms a whole that can be integrated in the system of values and concepts of the groups concerned is there a chance that it will be accepted with good results. And only out of a feeling of security that presupposes a personal link between the health educator and his client will the latter be prepared to change his views.

It is obvious that the study of these problems does not belong to one field of specialism. In order for these problems to be solved, they need the combined operations of many sciences. The cultural anthropologist has his say in the matter just as has the sociologist, the social psychologist, and the psychiatrist. A mental health approach implies a multidiscipline manner of thinking and is, therefore, preeminently suitable to go deeper into these problems.

### **The Educator's Personality**

It is clear that the health educator, being an educator and wanting as such to change certain values and insights, cannot stop here. However much his technique may evolve toward the use of nondirective methods, his activity continually aims at making clear to his community the concepts and principles he is deeply convinced have value. And even if he succeeds in keeping his enthusiasm within bounds, the impetus of the health education movement is behind him, urging him on. Continually, posters and health drives remind him and his clients of the high ideal for which they are striving. Newspapers and magazines, films and radio, over and over again underline the importance of a healthy way of living. The missionary character of health education is not to be denied even when the underdeveloped areas are omitted from consideration.

Frequently, the health educator is driven



against his will into a position from which it is difficult for him to operate. The good educator would prefer a gradual penetration based on confidence. In fact, however, he finds himself among the storm troops. This position is accentuated by the historical development of medicine. Owing to the exceptional position he has acquired in a modern community (2), the physician is undeniably an authority to whom the public reacts with a dependent attitude. That same attitude is more or less transferred to everyone concerned with medical care and public health work. The nurse, the pharmacist, and the health educator, all share in the aura of the physician's halo.

It is often hard for the individuals in question not to be impressed by being vested with such a halo. A vocational personality deformation developing in the direction of an authoritarian personality (3) may easily occur in such persons. It is difficult indeed to avoid such a deformation if the individual always has to act as "the man who knows."

(It would be interesting to test the hypothesis that those who are active in the field of curative medicine and public health have gone through a personality development during which, in a certain phase, anxiety about their own physical well-being played an important role. Compensation for this anxiety might play a supportive part in the fixation of their authoritarian attitudes.)

One might think that the dependent attitude in patients or the health educator's clients and in the public in general, which is a corollary of the authoritarian attitude in medicine, creates a favorable atmosphere for the transfer of knowledge. Modern psychology, however, tends to postulate that the reverse is true. The fact is that dependency is nearly always accompanied with ambivalence. The pupil is inclined to reject, at least unconsciously, the ideas and principles to which he is exposed in the authoritarian learning situation. It is a well-known phenomenon that children reared under authoritarian principles demonstrate in their behavior the reverse of what has been taught them. Similar processes might easily nullify the good intentions of much health education activity.

The same factors also contribute toward in-

creasing the feelings of guilt in the people concerned. It will be easy for the authoritarian health worker to make his client believe that illness could have been avoided. The patient "should have taken measures sooner," "should have been more careful," "should not have become overtired." Even without the patient's falling ill, a feeling of guilt may arise in connection with the patterns of behavior which the health educator tries to teach his clients. Thus, we find individual and collective health care gradually operating in an atmosphere of guilt and anxiety which tend to make the net result a negative one (4, 5). As a result of this anxiety, some individuals will develop a hygiene complex of obsessive character. Others will become victims of their oversensitiveness and fear of illness and begin to show iatrogenic illness. Along less evident lines, it may be possible that for a third group the anxiety complex promotes the development of psychosomatic illnesses.

The consequences of an authoritarian atmosphere upon the beneficiaries of health education compel us to pay special attention to the personality of the health educator. From a mental health point of view, it will be necessary to demand emotional maturity of anyone whose vocation is practical health education. Those who have not solved the authority problem and are not free in their relations toward others are a hindrance rather than a help in this field. In this respect, a very high standard should be imposed upon the health educator because the culture of the medical world invites authoritarian behavior. That special qualities (intelligence, imagination, and so forth) must be demanded of the health educator as a matter of course is clear although this fact is often made light of, in health education as well as in general education.

These mental health aspects are also of special importance with respect to the training and supervision of health educators. Training experiences may be of decisive significance in the attitude toward the public which they impart to the trainee. Along with training in various techniques, the personalities of trainees should be shaped in such way that they are well protected against emotional rigidity. Group methods in their modern form are more suitable than



anything else to give health educators the necessary experience and to teach them to work through their emotional problems. The climate of the organization in which these educators work and the character of the supervision they receive may help in retaining the assets of a suitable personality and an emotionally healthy training program.

### **Bodily and Emotional Development**

Even when concentrating on physical aspects, health education touches on many subjects that have direct effect on emotional development. Instruction of expectant mothers, nursing of newborn babies, and toilet training of infants are all subjects concerning which the psychological aspects are at least as important as the physiological. The education of the public with respect to such measures of preventive medicine as vaccination, mass X-ray programs, and cancer control has individual and mass psychological consequences. Injudicious behavior may lead to all kinds of complications and create unnecessary anxieties. The education of the patient undergoing recovery and his reeducation to prevent setbacks are charged with sentiment and fears. This is conspicuously true of psychosomatic illnesses. Sex instruction at the age of puberty, preparation for marriage, advice during the climacteric, and special health reorientation for aging people are all given in periods which are psychologically precarious. In such phases, basic anxiety may be reactivated and lead to loss of mental health.

Because of the rapid growth of our knowledge of emotional factors which play a decisive part in these bodily processes, health education is confronted with far-reaching problems. In a short space of time, strictly hygienic advice has become obsolete. Modern health education has to find its answer to the challenge of this new era. For example, it cannot overlook the hypothesis that new weaning practices in an underdeveloped area may have decisive consequences for the personality development of a whole population. This may be equally true in a metropolitan district where the population may be quite susceptible to propaganda suggesting such a change. The individual health educator may feel powerless in seeking an answer

to such worldwide problems, and he may rely on the guidance of a group of experts. In his daily practice, however, he will be confronted with questions just as vital when treating individual cases. An incorrect answer to an anxious mother's question in a group discussion on toilet training may unfavorably fixate her still uncertain attitude toward her child and thus contribute to the creation of an infantile neurosis in the child when he approaches adulthood. If he has not by that time solved his own sex problems, that fact may prevent his understanding the more profound sense of a remark during a biology lesson. Thus, the moment passes for the catharsis of a worrying adolescent. Overemphasis on rules of life for the aged may often lead to neglect of the "natural" right of old people to prepare themselves mentally for death.

An ever so perfect mastery of flannel board and other visual aid techniques, of group dynamics and conference methods, and a profound knowledge of the most up-to-date methods of preventive medicine are not in themselves an assurance that the health educator has the solutions to the life problems which pop up during the treatment of apparently simple health problems. A health education which is not supported by an extensive knowledge of emotional factors and whose expounder is not the possessor of a mature personality will fail to give the correct answer at the right moment to crucial questions.

Even then, there will still remain many cases in which it is impossible for the educator to act successfully if in due time he does not have recourse to the more expert knowledge of other specialists. One of the fundamental principles of modern mental health work, namely the flexible introduction of a series of experts (6), applies equally to health education. It cannot operate in a void where help is lacking. Only when the health educator can function as mediator as well and knows how to transfer his task to others at the right moment will it be unnecessary for him to restrict his activities. As a link in public health, he cannot extend beyond the reach of the chain of other experts. Isolated propaganda for washing hands in an underdeveloped area where for miles around no uninfected water is to be found is as senseless as are

discussion groups on problem babies in a rural district where no child guidance clinic is available. "Aegrescit medendo" ("his disorder only increases with the remedy") is applicable here also (7).

### The Need for Teamwork

Thus far, we have restricted ourselves to the mental health principles underlying physical health education. The reorientation of public health, however, has led to the acceptance of mental health as an autonomous objective. The preamble of the World Health Organization testifies sufficiently to this.

Even if one does not consider the formula of mental well-being and what it might ultimately embrace but instead restricts oneself to the greatest common divisor acceptable for many cultures—emotional maturity and fullest development of capacities—the program of health education is enlarged considerably. Then it is no longer possible to limit oneself to those phases of human development in which specific physiological processes may impair the emotional and intellectual development.

Other phases of human development become of equal importance to the health educator. With just as much insight, he will have to deal with the problems of the emotionally vulnerable phase of the 4-year-old child, and he should at least know what symptoms are important for parents to note in such a period. The vulnerable age group of 8 to 10 years becomes an important subject on which to give advice to parents and teachers, because the children in this group are in a period of rapid development of the intelligence and of social adaptation. The physically mature man of 30 who, full of ambition, throws himself into a career, passes the "point of no return," and, as successful president of a company, succumbs at the age of 50 or so under a too heavy emotional strain (with or without a peptic ulcer!) needs help from the health educator.

Where are the points of contact for a health educator who wants to draw such phenomena—not at all pathological—within the scope of his activity? It is clear that health education as a separately operating unit cannot start tackling such problems right away. These problems are

too complicated and so intricately interwoven with the fundamental aspects of our present phase of culture that even the combined attempts of all men of good will may prove to be in vain.

Returning to the point from which we started, we should bear in mind that health education and general education more and more intermingle. Health education does not stand isolated but can join with the many educational institutions for young people and adults which are responsible for the changing of cultural values and the creation of new forms. It is with respect to mental health that health education, because of its origin, is entitled to speak. Rooted as it is in the world of medicine where some of the principal insights into these emotional problems have developed, health education may, provided it is well equipped, voice truths which are all too often forgotten in other fields. In this domain, its appeal for better mental health will not be directly addressed to the public. It should be restricted provisionally to key persons—educational authorities, administrators, and leading industrialists—who, better than others, are able to convert such mental principles into action. In all modesty, but with a maximum of human strategy, health education may thus assist in realizing those values in the mosaic of which health gains its full significance.

### REFERENCES

- (1) Frank, L. K.: Health education. *Am. J. Pub. Health* 36:357-366 (1946).
- (2) [Gadourek, I:] Notes on speeches delivered. *Mens en Onderneming* 6:56-59 (1952).
- (3) Adorno, T. W., and others: Authoritarian personality. In *Studies in prejudice*. American Jewish Com. Social Studies Series. Pub. No. 3. New York, Harper and Bros., 1950.
- (4) Winsemius, W.: Veiligheidspropaganda. *Mens en Onderneming* 6:8-19 (1952).
- (5) Hovland, C. I.: Changes in attitude through communication. *J. Abnorm. and Social Psychol.* 46:424-437 (1951).
- (6) Frank, L. K., and Mead, M.: The International Preparatory Commission [content of the IPC statement]. In *International Congress on Mental Health* [3d], London, 1948. London, H. K. Lewis and Company; New York, Columbia University Press, 1948, vol. 1, pp. 82-85.
- (7) Vergil: *The Aeneid*. Bk. 12: l. 46.

# Recent Mortality Trends in Areas of Low Mortality

By IWAO M. MORIYAMA, Ph.D.

**F**ORTY-FOUR COUNTRIES reported an average crude death rate of less than 10 per 1,000 population during the period 1948-50. A crude death rate of that magnitude might well be taken as characterizing areas of low mortality. However, a low recorded crude death rate does not necessarily signify low mortality. Death statistics, particularly those collected under diverse conditions of administration, culture, geography, and population distribution and composition may yield numerically similar overall mortality rates even though the age-specific death rates differ greatly.

The selection of areas of low mortality is an arbitrary procedure. There does not appear to be any one method that is completely satisfactory. For the purpose of this discussion, the measure selected for designating areas of "low mortality" was life expectancy at birth. A life table value was selected rather than the crude death rate since some weight is given to the age-specific death rates. However, the weights (stationary population) vary from area to area. This is not a particularly desirable

feature of a life table death rate, but it was selected in preference to the age-adjusted death rate for two reasons. First, the use of a standard population as weights is not satisfactory if the age composition of the actual populations is not similar to that of the standard population. Second, death rates adjusted to a single standard population are not readily available for individual countries, and the labor involved in computing them is not inconsiderable.

Areas of low mortality were first delineated by taking areas in which the life expectancy at birth in 1949 or 1950 exceeded 65 years (life table death rate of less than 15.4 per 1,000 population). Excluded from this preliminary listing were areas where death registration was adjudged in the United Nations Demographic Yearbook to be incomplete or inadequate, and areas that did not include in their statistics data for the total population in the area. Although data for Australia and New Zealand exclude aborigines and Maoris, respectively, an exception was made of them since the number of deaths among the excluded groups is relatively small and would not affect the level of mortality significantly even if included.

On the basis of this procedure, the following areas were selected as representing areas of "low" mortality: Denmark, Iceland, the Netherlands, Norway, and Sweden; Belgium, England and Wales, France, and Scotland; Italy and Switzerland; Canada and the United States; and Australia and New Zealand.

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Recent mortality trends for these areas are somewhat difficult to describe because of the intervention of World War II. Countries that were under hostile attack or under enemy occupation experienced severe upswings in mortality during the early 1940's. The death rates for the other countries were also higher in varying degrees during the war years because of the movement of the armed forces population for foreign duty. Since deaths and population of the armed forces outside of the country are usually not included in computation of death rates, and because the armed forces come from a segment of the population with normally low death rates, the death rates during the war years were generally artificially increased by the effects of troop movements and hence not comparable with the prewar and postwar death rates.

While crude death rates have considerable significance as indications of the rate of population loss through mortality, they may be affected to a considerable degree by differences or changes in population composition, particularly

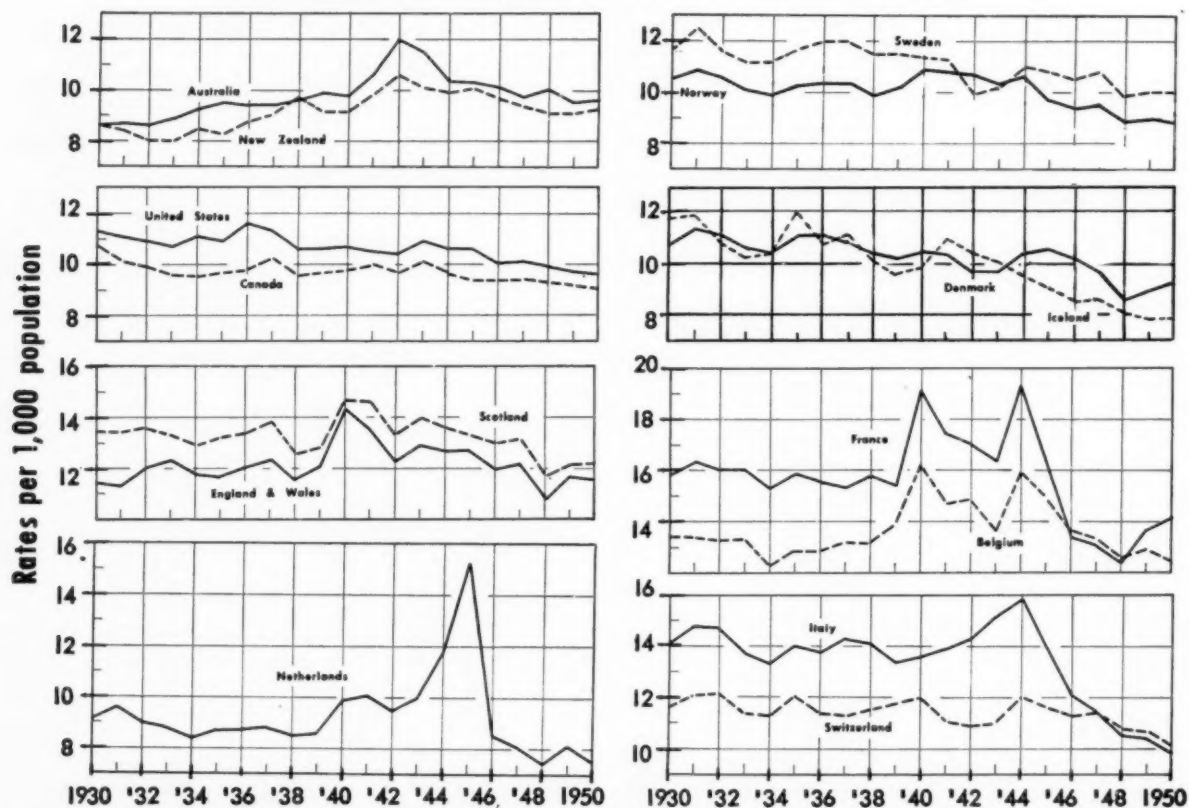
with respect to age. Therefore, age-specific death rates were computed wherever data were available for the years around 1930, 1938, 1947, and 1950. The years 1930 to 1938 were taken as the prewar years, and 1947 to 1950 as the postwar period. Death rates at the beginning and end of each period were compared. Because of the variability of death rates, precise evaluation of trend is not possible by this method. However, it does give a rough indication of trend.

### Mortality Trends

The level of general mortality for areas of low death rates varies over a wide range. The lowest recorded crude death rate in 1950 was 7.5 per 1,000 population for the Netherlands and the highest 14.2, for France. All of the crude death rates, except those for France, Belgium, Scotland, England and Wales, and Switzerland, were 10 per 1,000 population or lower in 1950.

The trends of crude death rates show several different patterns (see chart). Despite the

Crude death rates for specified areas of low mortality, 1930-50



SOURCE: Demographic Yearbook of the United Nations.



existing differentials in the levels of mortality, the patterns appear to be uniform geographically.

Prior to World War II, the trend of the crude death rates for most of the countries was downward or stationary. Exceptions are noted for England and Wales, Australia and New Zealand, where there has been a reversal of the downward trend. During World War II, increased mortality was experienced in virtually all of the countries. The upswing in mortality was particularly violent in the Netherlands, France, Belgium, Italy, Scotland, and England and Wales. However, the rapid postwar decline in mortality has brought the crude death rate back in line with the prewar trend. The postwar drop in the death rate for Italy and France was especially great.

The age-specific death rates show significant improvements in every country of low mortality over the past 20 years (see table). The reductions in death rates have been greatest for the younger ages. In the older ages, the decrements are smaller, and in a few countries small increases have been recorded.

Unusually low levels of mortality have been attained in the areas of low mortality. The indications are that the reductions in mortality are continuing. Future prospects for further improvements are good, especially in countries like Italy, France, and Belgium, where the death rates at the younger ages are still high compared to those for other countries of low mortality. On the other hand, substantial increases in life expectancy at birth cannot be as readily achieved in most of the other areas where the age-specific rates are already low, unless some unusual means are found to reduce mortality in the older ages.

Even with the declining age-specific death rates, there will be a point in time when the crude death rate will turn upwards because of aging of the population. Indications of such a situation may be observed in the crude death rates for Australia, New Zealand, and England and Wales in the years prior to World War II.

#### *Oceania*

By the early 1930's, the crude death rates for Australia and New Zealand had declined to their lowest levels, and Oceania was the area of

lowest mortality as compared with the rest of the world. However, in the same decade, the crude death rate took a definite upward turn. During World War II, both Australia and New Zealand experienced a marked increase in mortality. Since mortality statistics for Australia include military deaths outside the country, the wartime rise is explainable. On the other hand, the statistics for New Zealand do not include deaths of armed forces outside the country. Hence, the reason for the wartime peak in 1942 is not as clear unless it represents the effects of the movement of able-bodied men for military service out of the country.

The postwar decline in mortality has brought the crude death rates to their prewar levels. However, there is a hint of a resumption of the upward trend in the crude death rate evident in the prewar years. The inclusion of data for 1951 reinforces the suggestion of a continuation of an upward trend in the crude death rates for both Australia and New Zealand.

The rising trend of the crude death rates in the prewar years is partially explained by the increase in mortality by age. In the period 1933-38, the only age group in Australia for which a decline was recorded in the rate was the age group 25-44 years. In the postwar years there was a substantial drop in the death rate for some segments of the population, namely, the infant and preschool children and the 25-44 year age group. On the other hand, a relatively large increase was reported for the 15-24 year age group and a smaller rise for the age group 65 years and over. For the period 1933-50, the age specific death rates for the various age groups in 1950 may be seen to be considerably lower than those for the corresponding ages in 1933, except for the age group 45 years and over.

The mortality experience for New Zealand is marked by relatively large increments in rates for every age group between the years 1933 and 1938, the period of greatest increase in mortality in New Zealand. The increases were particularly large in the younger ages. In the postwar years, the rates dropped for every age group except for children of school age, 5-14, and in the old age group. Although the crude death rate for 1950 was higher than that re-

# Death rates by age: 15 selected countries, for specified years

[Exclusive of fetal deaths. Rates per 1,000 population in each specified group.]

Area and year	All ages	Under 1 year	1-4 years	5-14 years	15-24 years	25-44 years	45-64 years	65 years and over
<b>NORTH AMERICA</b>								
Canada: <sup>1</sup>								
1950	9.0	11.2		0.8	1.2	2.2	10.9	61.4
1947	9.4	48.9	2.5	.9	1.6	2.6	11.5	62.5
1938	9.5	18.3		1.6	2.1	3.4	11.3	65.8
1931	10.1	24.0		1.7	2.8	4.2	11.9	64.1
United States:								
1950 <sup>2</sup>	9.6	33.0	1.4	.6	1.3	2.6	13.1	62.3
1947 <sup>2</sup>	10.1	34.5	1.6	.7	1.6	3.0	14.1	63.7
1938	10.6	58.0	3.8	1.2	2.3	4.4	15.4	69.8
1930	11.3	69.0	5.6	1.7	3.3	5.7	16.8	73.7
<b>EUROPE</b>								
Belgium: <sup>3</sup>								
1950	12.5	55.8	1.9	.6	1.3	2.7	11.9	67.9
1947	13.2	72.9	2.9	1.0	2.1	3.7	12.8	67.0
1938	13.4	89.3	5.8	1.7	2.7	4.4	14.2	69.9
1930	13.4	106.8	8.3	2.1	3.7	5.0	14.5	70.9
Denmark: <sup>4</sup>								
1950	9.2	7.0		.5	.8	1.8	9.1	63.9
1947	9.7	39.9	1.8	.6	1.2	2.4	10.0	65.6
1935	11.0	19.3		1.3	2.0	3.3	11.9	74.7
1930	10.8	20.1		1.2	2.5	3.6	11.8	70.0
England and Wales:								
1950 <sup>5</sup>	11.6	29.8	1.4	.6	1.1	2.1	11.2	69.1
1947 <sup>2</sup>	12.0	12.1		.8	1.5	2.6	11.8	68.2
1938	11.6	55.1	4.6	1.5	2.2	3.3	13.1	69.0
1930 <sup>6</sup>	11.4	64.6	7.0	1.9	2.7	4.1	13.7	67.9
France: <sup>7</sup>								
1950	12.6	48.7	2.3	.6	1.3	2.9	11.3	65.2
1946	13.6	90.5	4.4	1.2	2.3	3.8	11.7	69.4
1938	15.7	17.7		1.5	3.2	5.8	16.7	80.7
1931	16.5	75.8	6.7	2.1	4.2	6.2	16.8	86.9
Iceland:								
1950	7.9	22.8	1.3	.8	1.2	2.9	8.8	59.0
1947	8.5	22.9	2.5	.9	2.1	3.1	9.8	60.9
1930	11.5	46.4	4.6	1.9	6.6	7.4	13.1	56.9
Italy:								
1950	9.8	67.7	4.9	.9		4.5		63.0
1947 <sup>8</sup>	11.4	90.7	8.0	1.5		5.4		66.6
1936 <sup>2</sup>	13.9	101.9	13.9	2.0	3.3	4.7	13.3	78.3
1931	14.8	115.0	16.5	2.3	3.7	5.1	13.7	77.8

corded for 1933, the age-specific death rates for 1950 were lower than those for 1933.

## North America

After a period of rapidly declining mortality, there was a deceleration in the rate of decrease in the crude death rates for Canada and the United States in the decade prior to World War II. In the mid-1930's there was a brief period of upswing after which the course of mortality resumed its trend downward. The recorded crude death rates for Canada and the United States were somewhat higher during the war, but a good part of the change was due

to the technicalities of rate computation, that is, the exclusion from the numerator and denominator of the rates, deaths, and population, respectively, of the armed forces overseas. The overall death rates for Canada and the United States follow an amazingly parallel course with Canada recording lower rates.

The age-specific death rates for Canada and the United States indicate continuous decline in mortality at every age. The rates of decline during the prewar years were greater in the United States, whereas in the postwar period this is not consistently true. In general, the decrease in rates has been greatest in the

# Death rates by age: 15 selected countries, for specified years—Continued

[Exclusive of fetal deaths. Rates per 1,000 population in each specified group.]

Area and year	All ages	Under 1 year	1-4 years	5-14 years	15-24 years	25-44 years	45-64 years	65 years and over
EUROPE—Continued								
Netherlands:								
1950.....	7.4	25.7	1.6	0.5	0.8	1.5	7.9	57.9
1947.....	8.0	34.4	2.3	.8	1.5	2.1	8.6	57.0
1938.....	8.5	37.6	3.2	1.0	1.5	2.5	10.3	65.3
1930.....	9.0	53.2	5.2	1.4	2.1	3.1	11.0	64.8
Norway:								
1950.....	9.1	6.7		.7	1.1	1.7	7.5	61.9
1947.....	9.5	9.4		.8	1.7	2.4	7.9	61.3
1938.....	10.0	10.4		1.0	2.3	3.7	9.8	66.4
1930.....	10.5	12.0		1.6	3.8	5.1	10.7	63.4
Scotland:								
1950 <sup>5</sup> .....	12.4	39.0	1.8	.6	1.5	2.9	13.2	74.8
1947 <sup>2</sup> .....	12.9	56.7	2.9	1.1	2.2	3.4	13.4	72.2
1938.....	12.6	73.9	6.6	1.6	2.5	3.9	14.9	74.8
1930 <sup>9</sup> .....	13.3	91.2	10.2	2.2	2.9	4.9	15.6	75.8
Sweden:								
1950.....	10.0	21.4	1.3	.5	1.0	1.8	8.8	65.8
1947.....	10.8	25.9	1.5	.7	1.5	2.4	9.5	70.2
1938.....	11.5	44.0	3.0	1.2	2.6	3.5	11.2	71.7
1930.....	11.7	57.2	3.9	1.7	3.5	4.5	11.6	67.5
Switzerland:								
1950.....	10.0	32.4	1.9	.6	1.1	2.2	10.4	62.7
1947.....	11.4	40.0	2.5	1.1	1.9	2.8	11.6	71.7
1941.....	11.1	46.4	3.0	1.2	2.2	3.2	13.0	68.4
1930.....	11.5	14.5		1.6	3.1	4.4	15.6	73.5
OCEANIA								
Australia: <sup>10</sup>								
1950.....	9.6	25.0	1.6	.7	1.3	2.1	11.7	67.5
1947.....	9.7	28.4	1.8	.7	1.2	2.4	12.0	66.7
1938.....	9.6	39.2	3.4	1.2	1.9	3.2	12.2	67.3
1933.....	8.9	10.8		1.2	1.8	3.5	12.2	63.9
New Zealand: <sup>11</sup>								
1950.....	9.3	23.3	1.2	.5	1.1	1.8	10.5	61.4
1947.....	9.4	7.6		.5	1.2	2.0	11.0	60.4
1938.....	9.7	10.8		1.4	1.9	3.3	12.0	67.3
1933.....	8.0	8.0		1.0	1.7	3.0	10.7	64.3

<sup>1</sup> Excluding Yukon and Northwest Territories, and prior to 1950, excluding Newfoundland also. <sup>2</sup> Excluding deaths among armed forces outside country. Rates based on population excluding armed forces outside country. <sup>3</sup> Including deaths among armed forces. <sup>4</sup> Excluding Faroe Islands. <sup>5</sup> Excluding deaths among armed forces outside country. Rates based on population including armed forces outside country. <sup>6</sup> Rates based on population enumerated as of Apr. 26-27, 1931. <sup>7</sup> Excluding deaths of live-born infants dying within 3 days after birth without being registered as live births. <sup>8</sup> Provisional. <sup>9</sup> Rates based on population enumerated as of Apr. 26, 1931. <sup>10</sup> Excluding deaths of full-blooded aborigines. <sup>11</sup> Excluding deaths among Maoris.

SOURCE: Rates were computed by the National Office of Vital Statistics. Basic data were from the demographic yearbooks of the United Nations or from the official statistical yearbooks of the individual countries.

younger ages and the average annual decrements smaller in the older ages.

## Europe

The areas of low mortality in Europe may be conveniently described in three groups, namely, the Scandinavian countries, areas of the United

Kingdom, and a group of other countries on the European Continent, specifically, France, Belgium, Italy, and Switzerland. The crude death rates for the European countries, except for the Scandinavian countries, are generally higher than those for other parts of the world. *Scandinavian countries.* The trends of the



crude death rates for Sweden, Denmark, Norway, Iceland, and the Netherlands during the decade prior to the war were generally downward, and form an undulating pattern. With the possible exception of Sweden, there was increased mortality in the Scandinavian countries during the war years. The Netherlands, in particular, suffered high mortality all through the war. The peak was reached in 1945, and the crude death rate recorded for that year was about 75 percent higher than the prewar rate. However, the crude death rates for all of these countries appear now to be in line with their prewar trends.

The age-specific mortality rates show a fairly consistent pattern. During the prewar years, death rates were declining for every age group, except 65 years and over in the Netherlands, Norway, and Sweden. In Denmark, increased mortality was recorded for those 5-14 years and 45-64 years in addition to the age group 65 years and over. In the postwar period, drops in rate were recorded for every age group in Denmark and Sweden, while in the Netherlands and Norway, decreases were reported for every age group except that of 65 years and over. The average annual decrements in the death rates at the younger ages were relatively large.

As compared with data for 1930, the death rates for 1950 were lower than those for 1930 in every age group. The drop in mortality is most conspicuous in the younger age groups.

*England and Wales and Scotland.* The rising trend in mortality for England and Wales is fairly evident in the prewar years. In Scotland, the crude death rate is higher than that in England and Wales, but the trend is not as clear. However, there appears to be a tendency for the crude death rates of Scotland to parallel those of England and Wales.

The wartime peak occurred in 1940 in both Scotland and England and Wales, after which the crude death rates decline rapidly in 1941 and 1943. Since 1943 the decline has been more gradual but fairly regular. A sudden drop in mortality in 1948 brought the crude death rates to the lowest levels ever recorded in England and Wales and in Scotland. While the rates returned to a higher level in 1949 and 1950, the crude death rates for these years are

much lower than those for the prewar years.

Unlike the general death rates, the age-specific death rates for both Scotland and England and Wales have been declining at every age except in the older ages. The average annual increase in the death rates for the population 65 years and over is relatively small. The rate of decrease in the death rates for the 45-65 year age group is considerably smaller than that for the younger ages. The average annual decrement in the age-specific death rates is greater in the postwar as compared with the prewar years.

*Other European countries.* The prewar trend of the crude death rates for France, Belgium, Switzerland, and Italy was generally downward. There is considerable similarity in the pattern of crude death rates for France and Belgium in the prewar and war periods. The rates for Switzerland and Italy were very much alike before the war.

The excess mortality in France and Belgium during the war was considerable. Two major peaks of almost equal magnitude occurred, the first in 1940 and the second in 1944. The decline in mortality was rapid after the war. This was true particularly in France, and the large differential that existed in the crude death rate between Belgium and France in prior years was closed. The crude death rate for France dropped below that for Belgium between 1946 and 1948, but in 1949 and 1950 the rate for France exceeded that for Belgium again. However, the rates for these years are not out of line from what the rates would have been had the prewar trend continued.

The crude death rates for Switzerland do not indicate any unusual change in mortality during the war period. On the other hand, the reported crude death rates for Italy show a continuous increase from 1940 to a major peak in 1944. As in France, the decline in mortality was rapid after the 1944 peak, and the postwar death rates dropped to the lowest levels ever recorded for the country, and the large gap between the crude death rate for Italy and Switzerland was wiped out. There appears also to be an acceleration in the decline of mortality in both of these countries after the war.

The age-specific death rates were decreasing in every age group before the war in France, Belgium, and Switzerland, and in every age



group except that 65 years and over in Italy. In the postwar period, the decline continued at an accelerated pace.

### Summary

The areas of lowest mortality selected for study include Norway, Sweden, Iceland, Denmark, the Netherlands, Scotland, England and Wales, France, Belgium, Switzerland, Italy, Canada, the United States, Australia, and New Zealand.

Although there is a large differential in the levels of mortality even among the areas of lowest mortality, several patterns of mortality trends are observed. Each of these patterns appears to be generally uniform geographically.

Prior to World War II, the trend of the crude death rates for most of the countries was downward or stationary. Exceptions are noted for England and Wales, Australia, and New Zea-

land, where there has been a reversal of the downward trend. Virtually all of the countries experienced increased mortality during World War II. However, in almost every instance, the rapid postwar decline has brought the crude death rates back in line with the prewar trend.

Significant improvements in mortality rates have been made in every country of low mortality over the past 20 years, particularly in the younger ages. The decline in mortality has not been especially large for the age groups over 45 years in most countries.

The prospects of further declines in mortality are good, especially in several European countries where the death rates at the younger ages are still relatively high. On the other hand, substantial increases in life expectancy at birth cannot be expected in most of the other areas where the age-specific rates are already low, unless death rates at the older ages can be reduced.

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## United Nations Day

President Eisenhower has proclaimed October 24, 1954, as United Nations Day.

On this ninth anniversary of the United Nations Charter, the President has urged that the citizens of this Nation demonstrate their faith and support of the United Nations with community programs that will create a better public understanding of its aims, achievements, and problems.

Pointing out that the United Nations represents man's most determined and promising effort to save humanity from the scourge of war and to promote conditions of peace and well-being for all nations, the President called for continued support of the organization. He stated that its success depends not only on the support given it by its members but equally on that of the people of the member countries.

In this, the October, issue of *Public Health Reports*, readers will find two articles on health projects in Iran that typify United States cooperation in international programs. Scheduled for early publication are a paper by John H. Stambaugh, assistant to the director of the Foreign Operations Administration, on the broad considerations which underlie the United States technical assistance programs in the health fields and one by Dr. John J. Hanlon, chief of the FOA Public Health Division, on a system of priorities that may be used as a guide in planning these programs.

# Iran's Public Health Cooperative Organization

By EMIL E. PALMQUIST, M.D., M.P.H., and  
FREDERICK F. ALDRIDGE, M.S.S.E.

WITH the signing of an agreement between the Ministry of Health of Iran and the United States Technical Cooperation Mission in Iran on December 31, 1952, a cooperative organization for the operation of a training and demonstration program in public health was established as an agency of the Iranian Ministry of Health. Patterned after the *Servicio* organizations used in Latin America for carrying out bilateral public health programs, the cooperative provides an administrative framework within which the governments of the United States and Iran pool their contributions in funds, supplies and equipment, and personnel. This integration of United States assistance into the structure of the Ministry was planned as a means of strengthening the chances for the continuance of a broad public health program after the withdrawal of foreign aid.

The agreement also established an Iranian-United States joint fund for public health, which is a depository in a mutually selected bank of the funds from the two countries and also from third parties—local governments, un-

official agencies, and individuals—for the expense of the cooperative's program. This joint fund enables the cooperative to have its own merit system for personnel, to establish its own budget, and to administer and expend funds on the basis of project agreements between the Ministry and the United States mission.

## Genesis of the Program

An active public health program in Iran dates back to early 1950, when the health section of its Seven Year Plan Organization—a government agency established in 1949 to administer developmental programs in agriculture, industry, education, public health, and other fields—began a malaria control program. At that time, the Iranian Ministry of Health's activities were limited, except for smallpox vaccinations, to operating clinical dispensaries and hospitals. In late 1950, however, with the partial dissolution of the plan organization, its health section was transferred to the Ministry of Health and became the department of preventive medicine. This department took over the operation of the malaria control program, but, before the establishment of the cooperative, it undertook few other public health activities.

The earliest official help from the United States after World War II toward developing a public health program was given in 1948 and 1949. At the request of the Iranian Government, three Public Health Service officers each spent about 2 months in the country studying the malaria problem and outlining a control plan, which was followed when the program

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*Dr. Palmquist, assistant chief of the Division of International Health, Bureau of State Services, Public Health Service, was chief of the health division of the United States Operations Mission to Iran from April 1951 through August 1953. Mr. Aldridge, now on assignment with the United States Operations Mission to India as assistant chief sanitary engineer, was chief sanitary engineer of the United States mission to Iran for the same period.*

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began in 1950; making entomological studies; and teaching courses in the engineering aspects of malaria control.

In March 1950, a mission composed of a physician, a sanitary engineer, and a public health nurse was sent by the Public Health Service for a 4-month observation and teaching tour. In addition to teaching a 6-week course in preventive medicine and public health at the University of Teheran School of Medicine in cooperation with the Iranian Ministry of Health and the health section of Iran's Seven Year Plan Organization, they participated in the beginning of the malaria control program.

The first members of the health division of the United States Technical Cooperation Mission (point IV), now the United States Operations Mission, arrived in April 1951 to give administrative and technical guidance to the Ministry of Health in developing a public health program. Their first action was to obtain DDT from the United States on an emergency basis and to provide administrative and technical guidance in the malaria control operations. At that time, the malaria control program was threatened with collapse or considerable delay because of a shortage of DDT.

### **Mission Objectives and Approach**

With the objective of assisting the country in developing a broad public health program, the United States mission has directed its efforts toward the carrying out of demonstration and training projects in such fields as environmental sanitation, health center operation, and public health education, in addition to malaria control. Before the establishment of the public health cooperative, projects, with the exception of those for malaria control, were carried out by agreement with the Ministry of Health but independently of the Ministry's program and under the mission's own organization. They were developed primarily on a regional basis in cooperation with the Ministry of Health's officials in the ostan<sup>s</sup> (provinces). This approach was used first, because, even though a department of preventive medicine existed, the Ministry of Health's activities were confined almost entirely to a medical care program; and

second, because the United States health activities were originally set up as a part of the regional activities of the Iran-United States rural development program, which included also programs in agriculture and education.

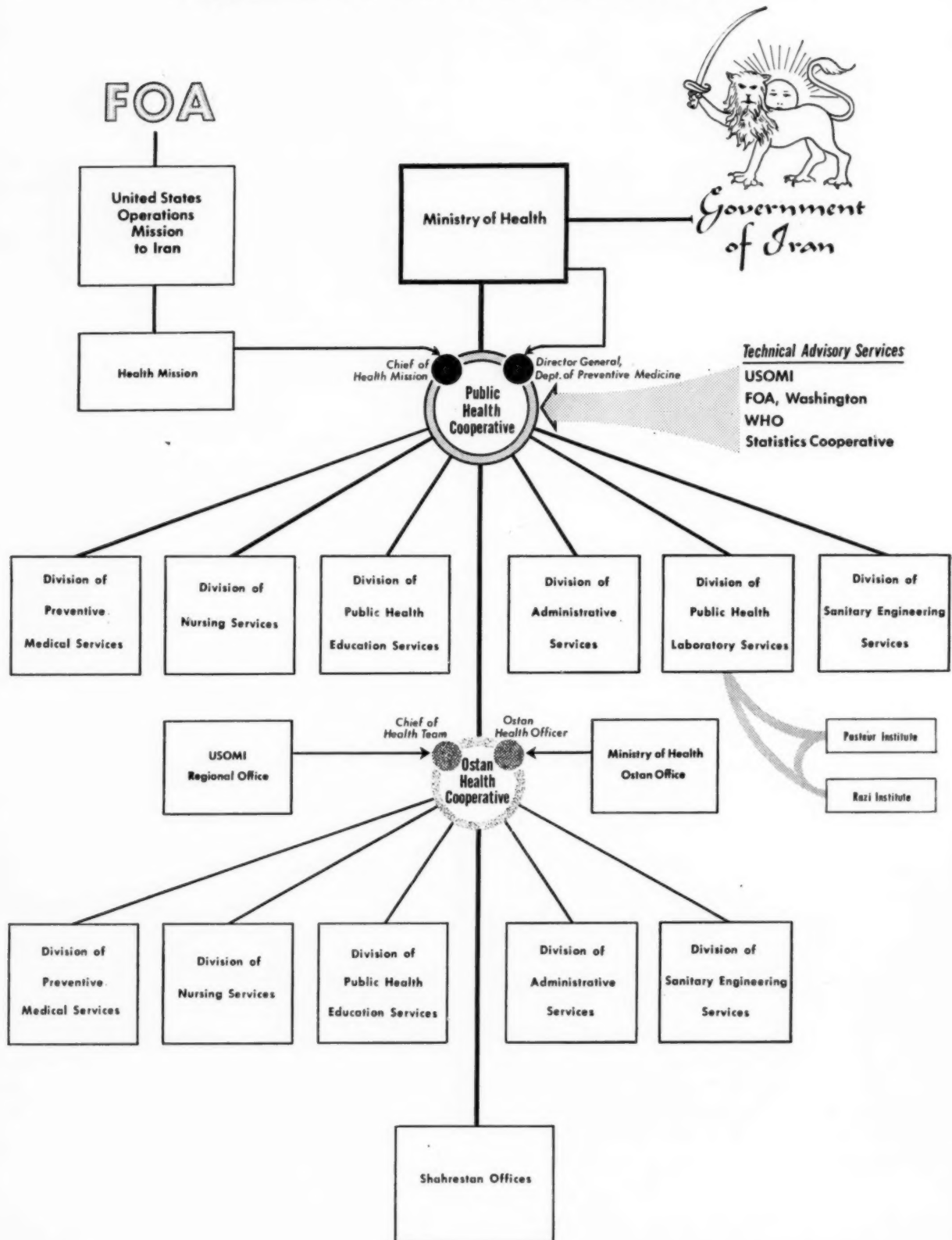
It was not intended, however, that the mission's health program should become an operating program or that it should be limited to an American program. Rather, as the demonstration and training projects proved their value, it was intended that the appropriate Iranian health agencies would take them over and incorporate them into their own programs. Development of projects at the ostan level was useful in placing emphasis on decentralization—one of the objectives of the public health program—but operation under the mission organization was not achieving the objective of establishing a public health program as a function of the Ministry of Health. Even though the majority of the operating personnel were Iranians, many of them on loan or detail from the Ministry of Health or one of the other ministries, the Iranians did not consider the program their own.

It was to facilitate the accomplishment of the latter objective that the public health cooperative was conceived. To continue emphasis on decentralization, the cooperative was established as a bureau of local health services of the Ministry's department of preventive medicine, and it was planned that offices of the cooperative would be established in the ostan<sup>s</sup> and in the shahrestans (subdivisions of the ostan<sup>s</sup>) to perform the actual work in carrying the public health program to the people. Thus far, cooperatives have been set up in 8 of the country's 10 ostan<sup>s</sup> and in several of the shahrestans.

### **Structure of the Cooperative**

The structure of the public health cooperative, both the central office in Teheran and a typical ostan office, is shown in the accompanying chart. The divisions of the central office are broken down into branches, which cover all the public health services usually provided by a State or large municipal health department in the United States, plus those particularly needed in Iran, such as midwifery services and malaria control.

# Organization of the Public Health Cooperative in Iran





The ostan cooperatives are modified to meet local needs. They are directly responsible to the central office of the cooperative in the Ministry of Health, but liaison is maintained between them and the office of the governor general of the ostan, who is responsible to the Minister of the Interior.

Also shown in the chart is the relation of the cooperative to the Ministry of Health and to the United States Operations Mission. According to the agreement between the two countries, the Minister of Health and the country director of the United States mission are its co-directors, but the director general of the Ministry's department of preventive medicine is designated to serve in behalf of the Minister, and the chief of the health division, called the health mission, of the United States mission is designated to serve in behalf of the country director.

Except for the sanitary engineering services and the health education divisions of the central cooperative, which have an Iranian as chief, each division and some of the principal branches also have an Iranian and an American as co-chiefs. In the ostan cooperative, the Iranian ostan health officer and the chief of the United States regional health personnel serve as co-directors.

All American health personnel in Iran are now assigned to functional positions in the cooperative, either in the central office or in one of the ostan offices, and the Ministry of



**An Iranian health visitor from the village clinic staff treats a child who has measles complicated by pneumonia. The child did not die, as did most children in the years before when they suffered from this sequence of red spots followed by choking breath.**

Health assigns personnel from its department of preventive medicine as mutually agreeable to the co-directors. Upon creation of the cooperative, all equipment, supplies, and facilities of the United States health mission and a considerable portion of those of the Ministry's department of preventive medicine were turned over to the organization, and specified sums of money from each country were consigned to the Iranian-United States joint fund. It was agreed that additional funds would be made available by both governments each year from June 30, 1953, through June 30, 1958. To augment these funds, the ostan cooperatives are encouraged to obtain contributions from local governments and organizations and from individuals.

### **The Cooperative Program**

To date, the malaria control program has been by far the largest and most spectacular in results of the public health activities in Iran. (Details of this program are given on pp. 976-981 of this issue of *Public Health Reports*.) However, demonstration and training projects in other fields of public health are now under way in the eight ostan where offices of the cooperative have been established.



**An Iranian nurse-midwife trainee, under the supervision of a United States public health nurse, is instructing village midwives in the proper method of sterilizing instruments.**

Participating in this program are 35 American public health personnel. By the end of fiscal year 1954, the United States contribution in technical assistance since April 1951 will have amounted to about \$20 million. This total includes expenditures for supplies and equipment for the demonstration and training projects and administrative costs, including expenses of the United States personnel. About one third of the funds has been allotted to the malaria control program; the remainder, largely to projects for the construction of water supply and distribution systems and sanitary privies, general sanitation projects, public health education, construction and operation of demonstration health centers and mobile health units, and subprofessional and professional training in the public health sciences.

#### *Health Centers and Mobile Units*

Since one of the major objectives is the decentralization of health activities, particular emphasis is given to establishing community health centers. These serve as a base of operations for providing preventive as well as curative health services and also as training centers for the thousands of health workers needed. Thus far eight completely equipped demonstration health centers have been set up. Pending construction of new buildings, old ones have been rented and renovated.

Operating out of these centers are small mo-



**The use of a weir in measuring the volume of a stream is demonstrated to a sanitation class by Iranian and American instructors.**



**Women and children wait for the day's opening of the first health center the 4,000 inhabitants of Dastgerd, Iran, have ever known. It was built by the villagers with technical assistance provided by the United States Operations Mission to Iran and is staffed with Iranian medical technicians trained by the mission.**

bile units, which go into the villages in the area to make surveys of special health problems, to handle epidemics or disasters, and to provide health services. Some 25 of these units, mounted on four-wheel-drive jeep truck chassis, have been constructed locally. In addition, three large mobile health units, equipped with good laboratories for making disease incidence studies, have been provided by the United States.

#### *Environmental Sanitation*

The problem of a safe and adequate supply of water is one of paramount importance. In many villages, water for washing, bathing, and drinking is circulated in what is actually an open ditch, which is subject to gross contamination by human and animal wastes. Hand-dug, uncased wells are often located within a few feet of the family privy.

To meet the water supply problem, the public health cooperative is contributing technical assistance and materials for the construction of large powered deep wells, storage tanks, and underground distribution systems in the larger villages, and hand pump systems for hand-dug and driven wells in the smaller villages. These projects, often including also the construction of public laundries and sanitary public baths, are carried out in collaboration with village co-

operatives, to which they are turned over for maintenance and operation after completion. In Teheran, the health cooperative is constructing a complete water treatment plant for Iran's first complete underground piped water supply system.

Another major undertaking is the design and construction of privies and privy slabs which meet minimum health standards and, at the same time, are in line with the cultural pattern and habits of the people. Installations in the thousands have been made. Spearheaded by the water system and latrine construction activities, vector control and general cleanup projects are now being developed as a result of organized and planned health educational efforts among the villagers.

### *Sanitation Training*

As a part of the health center program, training of subprofessional sanitation personnel, known as sanitarian-aides, is carried on in the villages under the direction of the health cooperative. Such training has been an important part of the health projects almost from the beginning of the United States technical assistance program. Sanitarian-aides are employed as leaders of village DDT-spraying teams and as assistants in the environmental sanitation projects.

Late in 1952, a special training school was established in a large village near Teheran to provide further training for the most promising sanitarian-aides. There they receive a 5-month course of didactic and field training in environmental sanitation. Upon completion, they return to the villages to supervise and train resident village sanitarian-aides. The school is conducted by the Near East Foundation (under contract to the United States Operations Mission) in collaboration with the public health cooperative.

### *Nursing Education*

Nursing as a profession in Iran is so new and candidates for nurse training are still so limited in number that a sufficient supply of trained nurses will not be available in the foreseeable future. To help meet the immediate needs for women health workers in the health center pro-

grams, particular attention is being given to the training of subprofessional personnel called health visitors, and to the training of village midwives in safe techniques of delivery and baby care.

A 6-month course in basic hygiene, sanitation, nursing arts, and public health techniques has been devised for training health visitors. Trainees are selected from among girls who have completed the equivalent of junior high school. After completion of the course, health visitors are assigned to the villages to train village girls as health visitor-aides and to supervise their work.

In professional nursing, the health cooperative is giving assistance to the new nursing school now being completed by the Iran Foundation in Shīrāz and to the Reza Shah Hospital School of Nursing in Meshed.

### **Objectives of the Cooperative**

It was intended when the public health cooperative was established that it should serve as a training and demonstration program, carrying out only in selected areas the activities which would normally belong to the Ministry's department of preventive medicine. The administration and operation of public health projects under the cooperative arrangement has stimulated such confidence in the organization on the part of the people and the government, however, that it is being asked to take over the entire program of the department. Other ministries of the government are also becoming interested in the cooperative idea and are making inquiries.

The ultimate goal of the cooperative, with its central and ostan staffs, is to train, in adequate quality and quantity, Iranian health workers as replacements for American personnel and to integrate completely the public health program into the structure of the Ministry. As soon as the Iranians who are now serving as co-chiefs of the various units of the cooperative are able to handle the job alone, they will become the chiefs and the Americans will become advisers, as long as their services continue to be needed at all. Gradually, over a period of several years, United States personnel can be withdrawn, leaving the Iranians to carry on the program.



# Malaria Control in Iran

By **EMIL E. PALMQUIST, M.D., M.P.H., and**  
**FREDERICK F. ALDRIDGE, M.S.S.E.**

**T**HE MALARIA control program in Iran, begun on a large scale in 1950, reached nearly 5 million of the country's 18 million people in 1953. House spraying with DDT was carried out in approximately 15,432 villages in almost all the geographic regions of Iran, a country equal in area to the United States east of the Mississippi River.

In Iran, as in many countries in the Middle and Far East, malaria has long been one of the major health, as well as economic, problems. According to Iranian estimates, as many as 4 million cases occurred annually before the control program was begun. Especially malarious are the area along the Caspian Sea to the north, the province of Azerbaijan to the northwest, and the area along the Persian Gulf to the south; and these sections have witnessed the most intense control measures to date. However, malariometric surveys made in hundreds of village groups have indicated that malaria is endemic in a large majority of the villages throughout the country.

The malariometric surveys, which are carried out each year as a part of the control program, have also provided evidence that the spraying operations are effectively reducing malaria. Along the Caspian Sea, for example, the spleen index for children aged 2 through 9

years has dropped impressively—in one village, from 100 percent in 1950 to 8 percent in 1953 (see chart).

In addition, verbal reports from many sources attest to the success of the malaria control program. Typical is the one by the Iranian Ministry of Health physicians in dispensaries and hospitals in the Caspian Sea area in the fall of 1952 that they had seen only 10 or 15 malaria patients during the entire malaria season that year, whereas in previous years they had seen 20 to 100 daily. A farmer in the same area related that only 4 persons per hectare are required to harvest his rice crop, whereas formerly 10 were needed.

## Cooperating Organizations

The campaign against malaria in Iran is a truly cooperative program. Working together are the Iranian Ministry of Health, the Iranian Institute of Malariology, a World Health Organization malaria control advisory unit, and the health division of the United States Operations Mission to Iran. Since the end of 1952, the funds, equipment and supplies, and personnel of the Ministry and of the health division of the United States mission have been combined within a single organization, the public health cooperative. This organization, a unit of the Iranian Ministry of Health, now has the responsibility for the planning, organization, and administration of the program and the provision of supplies, equipment, and most of the supervisory personnel for the spraying operations.

The World Health Organization unit, composed of a malariologist, an entomologist, and a

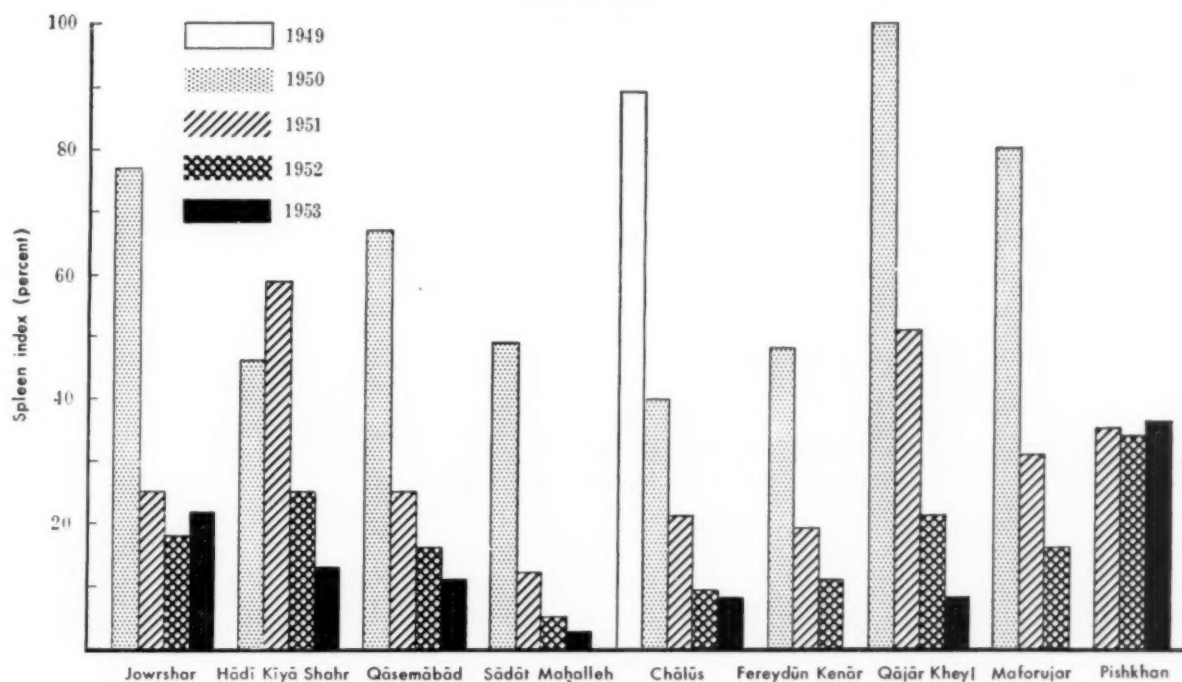
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*Dr. Palmquist and Mr. Aldridge were members of the health division of the United States Operations Mission to Iran from April 1952 until August 1953 (for additional information, see page 970).*

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**Spleen index for children aged 2 through 9 years in selected villages along the Caspian Sea, 1949-53.**



NOTE: All villages except Hādī Kiyā Shahr and Pishkhan were sprayed in the year when the surveys were made. Hādī Kiyā Shahr was sprayed annually beginning in 1951, and Pishkhan was sprayed in 1953. In 1952, Jowrshar was sprayed after the season of mosquito activity. In 1949, spraying of Chalus was a pilot program.

sanitary engineer, has provided valuable technical assistance in all phases of the program, but particularly in the collecting of epidemiological and entomological data. The increasing competence of the Institute of Malariology, established late in 1951, permitted withdrawal of the WHO personnel by the end of 1953. However, continued technical assistance is available from the headquarters staff of WHO.

The Institute of Malariology, which is supported by the public health cooperative, the Ministry of Health, and the University of Teheran School of Medicine, is now responsible for carrying out the malariometric surveys, which provide the necessary scientific data for a sound program. It also provides training in malariology for physicians, medical students, and personnel of the malaria control teams.

#### Decentralization of Operations

A major change in administration of the malaria control program took place in 1953: from centralization to decentralization of the spray-

ing operations. In the preceding years, the spraying operations had largely been carried out by mobile teams sent out from, and supervised by, the Ministry of Health in Teheran. Mobile teams which could be shifted from area to area as the spraying was completed were well-suited to a program for the control of a specific disease, such as malaria, but the method did have certain disadvantages, particularly as the program increased in scope. It imposed excessive hardships on the field staff, who had to leave their families in Teheran and move about the country from south to north and over again; it required the payment of bad climate allowances and travel expenses for the central staff who had to go into the field to supervise operations; and, probably most important, it did not encourage local participation in the program.

Therefore, following the establishment of the public health cooperative, plans were made for decentralizing the program by the creation of permanent malaria control units in the ostan (provincial) offices of the cooperative. The 5 units which had been set up as pilot projects

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# CAMPAIGN against MOSQUITOES



Malaria control operational zone boundary -----  
Operational zone headquarters •  
Suboffices ○

In the field and in the laboratory, the fight against the malaria-carrying *Anopheles* mosquitoes is being waged in Iran. For efficient, economic operation of the program the country has been divided into 10 malaria control zones, as shown in the map. The permanent malaria control unit in each zone is responsible for administering the program in that area, with overall direction and planning from the central office in Teheran.



The important anopheline vectors breed primarily in small waterholes in and around villages and in swamps and marshes in Iran. Shown is a typical breeding spot on the coastal plain along the Caspian Sea.



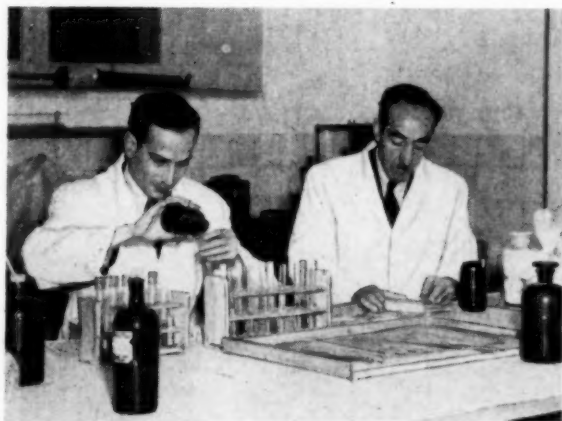
Right: A mosquito-catching station set up by the WHO malaria control unit.



At the Institute of Malariology, tests determine DDT residual after varying periods of time for various surfaces and DDT concentration. *Above:* Scrapings are taken from DDT-sprayed walls at the institute. *Below:* Laboratory analysis of the scrapings is made.



*Above:* Spray pumps made in Iran as a result of the United States-Iranian program to encourage local industry are now used in the country. They cost about half as much as imported ones. *Below:* Notice on building shows concentration of DDT with which it was sprayed and date of spraying.



A field spraying team prepares to move on to the next village. Donkeys are frequently used for transportation when the distance is short or when the destination is inaccessible by motor vehicle.

*Left:* In spraying the ceiling, the worker is careful to reach all surfaces.

in 1952 were officially informed that the 1953 malaria campaign in their areas would be their responsibility. The headquarters office would furnish them with a qualified staff nucleus, insecticides, and equipment, but the responsibility for administering the program and for obtaining local participation in the form of labor or money, or both, would be theirs. During the year, two additional stationary units were established, mobile teams forming the staff nucleus.

As would be expected, many difficulties arose during this period of change. In a few instances, for example, the decentralized units were reluctant to accept some of the personnel recommended by the central office. Also, it was necessary to dispatch mobile teams from Teheran to areas not served by the decentralized units. Such difficulties, however, can be worked out as the operation progresses, and all persons concerned are convinced that decentralization is accomplishing the objectives of increased efficiency, economy, and local participation. One of the advantages of the permanent units is the possibility of utilizing the staff during the off-malaria season for permanent malaria control and other environmental sanitation projects.

### Training Courses

Although on-the-job training for malaria control workers has been a continuous process, the first organized training course for them was held at the end of the 1952 malaria season. It was conducted by the Institute of Malariology, with assistance from personnel of the Ministry and the United States mission. A similar course was given at the end of 1953, and it is planned to repeat it in 1954.

The primary purpose of the courses, each lasting about 5 weeks, was to orient the malaria control personnel in malariology and environmental sanitation. The 1953 course was designed specifically to (a) familiarize the unit leaders with the administration procedures of the public health cooperative and with the objectives of decentralization; (b) emphasize the value of coordinating malariometric survey data with the spraying operations; (c) give

intensive training in permanent malaria control procedures, such as filling, draining, and repair of water body banks; and (d) give basic training in environmental sanitation procedures.

Originally planned for sanitary engineers who serve as unit leaders and assistant leaders, the 1953 course also included special lectures for senior sanitarian-aides and sanitarian-aides who serve as supervisors and leaders of field teams, statisticians, accountants, clerks, and vehicle drivers. With the exception of 1 day, which was devoted to a field study of survey techniques, lectures and laboratory work were given daily from 9 to 12 a. m., and special meetings were held each afternoon for the discussion of administrative problems. Written examinations for each group and practical examinations for the sanitary engineers were held at the end of the course, the results of which were one of the factors determining the selection and deployment of personnel for the 1954 malaria control season.

### The Anopheline Vectors

Because of Iran's geographic location, the species of *Anopheles* present in the country include some common to Europe, some common to India, and a few found in certain African districts. According to reports by Mario Giaguinto, M.D., chief of the WHO malaria advisory unit, research has confirmed the presence of 17 of the 18 species previously recorded for the country and has identified another species, *Anopheles subpictus*. The research has also provided much new information on the geographic distribution and seasonal prevalence of each species.

Of the 19 species of *Anopheles* found in Iran, however, only *maculipennis*, *sacharovi*, and *superpictus* (all palearctic species) can be considered important vectors in the northern and central plateau areas, and only *stephensi* and *culicifacies* (all Indian species) in the southern lowlands. The role of the species *fluvialis*, *pulehrrimus*, *multicolor*, *subpictus*, and *d'thali*, which are considered dangerous in other countries, is being investigated. Epidemiological evidence indicates that at least in the Caspian Sea area, *Anopheles hyrcanus*, although attack-



ing man frequently, is not of practical importance in the transmission of malaria.

Entomological observations have shown that in all northern and central plateau areas studied, anopheline activities are stopped during the winter season, a more or less long and a more or less complete hibernation taking place, depending upon the climatic conditions. In the south, however, activities of the *Anopheles* may continue throughout the year. These findings have been useful in determining the time to carry out DDT-spraying operations.

#### Plans for 1954

Despite the impressive reductions in malaria demonstrated in many localities, the disease is not yet conquered. Malarimetric surveys in March and April 1953 in the area along the Persian Gulf, for example, revealed spleen indexes for children aged 2 through 9 years of over 30 percent in 5 out of 13 villages. Moreover, some 20,000 villages—many of which are certainly malarious, though perhaps not to the degree of those which have been sprayed—are still untreated. And, of course, to maintain the gains

that have been made, spraying must be repeated for some time to come. Fortunately, the appearance of DDT-resistant mosquitoes has not yet been a problem in Iran, as it has in some other countries. The probability that resistance to DDT will eventually develop makes it all the more urgent to achieve the fullest measure of control in all areas in the shortest possible time.

Emphasis in the 1954 program will be on complete decentralization, with the establishment of additional stationary units. An epidemiologist and an entomologist have already been assigned by the Institute of Malariology to each of the public health cooperative ostan offices so that they can work in close contact with the local spraying teams. The program is being further strengthened in 1954 with aid from the United Nations Children's Fund in the amount of \$350,000 for DDT and transportation equipment.

Special attention will also be given in 1954 to the use of the malaria control staff for other environmental sanitation projects during the off-malaria season in anticipation of the day when malaria is no longer a major health problem in Iran.

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## PHS Advisory Council Appointments

**Mrs. Albert Lasker**, New York City, has been appointed a member of the National Advisory Cancer Council, National Cancer Institute, Public Health Service, for a 4-year term, beginning October 1, 1954. With her husband, the late Albert D. Lasker, Mrs. Lasker established the Albert and Mary Lasker Foundation, which gives awards through various health agencies for contributions to psychiatric and medical research and administration. Mrs. Lasker is also a member of the National Advisory Heart Council and an officer in various other health agencies including the Menninger Foundation, the Institute for Psychoanalysis, and the National Committee for Mental Hygiene.

**Dr. Harold P. Rusch**, editor-in-chief of the American Association for Cancer Research publication, *Cancer Research*, has also been appointed

to serve on the National Advisory Cancer Council for a similar 4-year term. Dr. Rusch has been active in cancer teaching and research at the University of Wisconsin since 1935 where he directs the McArdle Memorial Laboratory for Cancer Research.

**Dr. William McKinley Thomas**, a physician-surgeon of San Francisco, Calif., has been appointed to serve for a 4-year term on the National Advisory Mental Health Council, National Institute of Mental Health, Public Health Service. Since 1946 a member of the staffs of Mount Zion and Doctors Hospital in San Francisco, Dr. Thomas has previously practiced at Saint John's Hospital and Cushing Hospital in Leavenworth, Kans. During World War II he specialized in surgery and neurosurgery at Army hospitals in Arizona and California.

## Legal Notes

### on public health

Two recent court decisions have considerable interest for public officials with responsibilities in the fields of mental health and law enforcement. The Supreme Court of Missouri has held unconstitutional a recent statute modernizing procedures for the hospitalization of the mentally ill. The United States Circuit Court of Appeals for the District of Columbia has discarded the traditional, and all but universal, legal definition of "insanity" (the "ability to distinguish between right and wrong" and the "irresistible impulse" tests) as a test of criminal responsibility in the District of Columbia and substituted for it the broad test whether the criminal act charged was the product of mental disease or mental defect.

#### Hospitalization for Mental Illness Without Prior Court Order

The case of *Missouri ex rel. Fuller v. Mullinax*, decided on June 14, 1954 (269 SW 2d 72), came to the Supreme Court of Missouri on an original writ of mandamus to compel admission of a patient to a State mental hospital after the superintendent had refused admission on the basis of advice that the Missouri statute was unconstitutional. In conformity with the statutory admission procedures, the patient's admission was applied for in writing by her mother; the application was accompanied with the required medical certification stating the belief that the patient was likely to injure herself or others if allowed to remain at liberty; and it was duly endorsed by a probate court judge.

The statute provided for hearing or release of the patient on request: No patient admitted without full judicial procedures could be detained more than 48 hours after his request for release unless within that time the hospital head

## Recent Judicial Decisions Relating to Mental Health

certified to a court his belief that the patient's release would be unsafe for the patient himself or for others. The court could then authorize postponement of release for not more than 5 days to allow time for the commencement of judicial proceedings. The patient's right to release upon request or to the commencement of judicial proceedings is fortified by a statutory obligation imposed upon the head of the hospital "to provide reasonable means and arrangements for informing involuntary patients of their right to release . . . and for assisting them in making and presenting requests for release."

The court held that these admission procedures failed to satisfy the due process requirements of the Federal and Missouri constitutions because such procedures would permit persons to be deprived of their liberty without notice, hearing, or the opportunity of defending themselves on the issue of their sanity or mental illness. It further held that the deficiencies of the admission procedures were not cured by the provisions for hearing after request for release, although it did note a line of contrary cases from other jurisdictions.

The opinion repeats the established rule that the State, in the exercise of its police power, may provide for the apprehension of persons thought to be insane and for their temporary detention without notice or hearing until the truth of the allegation of insanity can be tested in a judicial proceeding. But the ruling in this case seems to say that a court proceeding is a constitutional requisite to any temporary hospitalization other than upon the patient's own application if the hospitalization extends beyond the immediate emergency, even though under the Missouri statute the patient could not have been kept in the hospital without a court order for more than 48 hours after her request for release. The inadequacy of these procedures, as viewed by the Missouri court, seems to lie in the omission of provisions which would make notice and hearing automatic in all

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*This note has been prepared by the Division of Public Health Methods, Public Health Service.*

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cases, rather than contingent upon the patient's later request for release.

The challenged Missouri statute embodied the substance of a draft act "governing hospitalization of the mentally ill." This was developed in 1951, by a working group called together by the then Federal Security Agency, along the lines of the recommendations contained in a 1950 study report prepared by the Council of State Governments, in response to a request of the National Advisory Mental Health Council of the Public Health Service. (See *A Draft Act Governing Hospitalization of the Mentally Ill*, Public Health Service Publication No. 51, Washington, D. C., Government Printing Office, 1952; and also *The Mental Health Programs of the Forty-eight States—A Report to the Governors' Conference*, Chicago, The Council of State Governments, 1950.)

One of the major objectives of the draft act was the framing of procedures for the indeterminate hospitalization of persons in need of treatment for mental illness which, even though the patient does not affirmatively consent to his hospitalization, would nevertheless eliminate most, if not all, of the medically objectionable features of many current procedures. More specifically, it was sought to avoid both the criminal connotations and the damaging exposures of the usual judicial procedures and to make admissions for treatment in a mental hospital as similar as possible to admissions and treatment in any other hospital. In addition to the danger of damaging effects on the condition of disturbed patients, reliance upon formal judicial commitment procedures as the basic process for admission to mental hospitals was thought to be a serious deterrent to early care.

The 1950 report of the Council of State Governments shows 11 States with alternative involuntary commitment procedures for indefinite hospitalization, which rested upon medical certification without court intervention. Under these procedures, judicial machinery is not put in motion unless there is a subsequent application. Also, aside from emergency commitment procedures, 9 States (3 of which are in the group of 11) permitted temporary observational commitment on medical certification without judicial order, for a period limited by statute but usually longer than the time per-

mitted under emergency procedures. (See *The Mental Health Programs of the Forty-eight States*, pp. 49-63.) At least two States—South Carolina and Kentucky—have recently revised their commitment legislation to shift the emphasis from legal to medical procedures for initial admissions (South Carolina Acts and Joint Resolutions, 1952, No. 836, p. 2042; and Kentucky Senate Bill No. 58, enacted March 1954). It is worth noting that the Interstate Clearinghouse on Mental Health of the Council of State Governments, 1313 East 60th Street, Chicago, Ill., has in prospect a compilation of State mental health legislation passed in 1954.

The draft act was built on this general pattern of newer State legislation, but gives greater attention to subsequent safeguards against unwarranted detention than some of the State statutes existing at the time. An important purpose of the new procedures was to encourage the hospitalization of nonobjecting, as well as of voluntary, patients by assuring prospective patients and their families that admission to a mental hospital for treatment was not a forfeiture of liberty. At the same time, it was necessary to provide some means of dealing temporarily with patients who could not safely be allowed to go unrestrained and to provide opportunity for prompt recourse to judicial proceedings for protection against wrongful detention.

The ruling in the Missouri case seems to foreclose, in that jurisdiction, opportunity for indeterminate hospitalization, not initiated by the patient himself, without formal judicial action. The opinion stresses the issue of an adequate basis for indefinite detention, rather than adequacy of the basis for admission and of subsequent protection against continued detention of an objecting patient. This contrasts with the basic principles of the draft act: ready access to needed care on the basis of medical judgments, with safeguards to assure prompt discharge when the patient's condition permits, and in all cases of admissions not pursuant to court order, release upon request unless judicial procedures are at once begun. The practical result of the decision is that if admission had been permitted the patient could have either left the hospital or have had her need for treatment established by court proceeding if she or her



parents requested her discharge. Now her treatment must wait until the need for hospitalization has been established by more formal procedures.

### The Issue of "Insanity" In the District of Columbia

Since 1882, the ability to distinguish between "right and wrong" has been the basic test of insanity in the District of Columbia for purposes of establishing criminal responsibility. In 1929, the "irresistible impulse" test was approved as a supplementary test.

In *Durham v. United States*, decided on July 1, 1954 (23 Law Week 2003), the United States Court of Appeals for the District of Columbia held that these tests were outmoded and unsatisfactory in the light of our present-day knowledge. For the future, the court declared the rule to be "simply that an accused is not criminally responsible if his unlawful act was the product of mental disease or mental defect."

The opinion reviews the history of the right-wrong test and the long effort to secure its revision; and concludes that the scientific and other authorities examined present "convincing evidence that the right-and-wrong test is 'based on an entirely obsolete and misleading conception of the nature of insanity.' The science of psychiatry now recognizes that a man is an integrated personality and that reason, which is only one element in that personality, is not the sole determinant of his conduct. The right-wrong test, which considers knowledge or reason alone, is therefore an inadequate guide to mental responsibility in criminal behavior." But, for the court, the fundamental objection was "not that criminal irresponsibility is made to rest upon an inadequate, invalid or indeterminate symptom or manifestation, but that it is made to rest upon *any* particular symptom. . . . In this field of law as in others, the fact finder should be free to consider all information advanced by relevant scientific disciplines."

The opinion presents, as a guide for the application of the new District of Columbia rule, the substance of appropriate instructions to the jury, which ends as follows: ". . . your task would not be completed upon finding, if you

did, that the accused suffered from a mental disease or defect. He would still be responsible for his unlawful act if there was no causal connection between such mental abnormality and the act. These questions must be determined by you from the facts which you find to be fairly deducible from the testimony and the evidence in the case."

In an interesting case—*Stewart v. United States*, decided on July 15, 1954 (23 Law Week 2034), which was considered with the *Durham* case for the purpose of reexamining the test of criminal responsibility when insanity is an issue—the court rejected a rule of "diminished responsibility," to be applied in capital cases, for mental disorder short of insanity. "Under such a rule, if the jury found (1) that the accused suffered from a mental disorder not amounting to insanity sufficient to excuse him from criminal responsibility under applicable tests, and (2) that such mental disorder deprived him of the requisite 'sound memory and discretion' essential for conviction of first degree murder, it could convict him of the lesser crime of second degree murder."

The court in the *Stewart* case recognized the force of arguments advanced for a rule of diminished responsibility—that it would accord with modern psychiatric knowledge which denies that people are either absolutely responsible or absolutely irresponsible, and that inability to deliberate or premeditate owing to mental disorder should, as when caused by drunkenness, preclude a conviction when the degree of the offense charged requires capacity to deliberate or premeditate or requires "sound memory and discretion." Nevertheless, the court concluded that reconsideration of the adoption of the rule in the District of Columbia should await appraisal of the results of the broadened test announced in the *Durham* case. "Only upon such an appraisal," said the court, "will it be possible to determine whether need for the rule remains."

A footnote to the opinion points to a survey (made by the amicus curiae) of State statutes and decisions related to the limited responsibility principle which showed that the doctrine had been accepted in 9 States, probably accepted in 5 more, rejected in 6, and probably rejected in 5.



# The Philadelphia Experiment With Garbage Cooking

By JOHN A. BAILEY, M.G.A., and ELMER T. WILLIAMSON

PHILADELPHIA became concerned in 1953, as did many other municipalities, with the immediate effect of the 1952 outbreak of vesicular exanthema and the cooking measures recommended for its control (1-4) because a substantial portion of the city's raw garbage has long been used for hog feeding.

With the passage of legislation (5) which required the cooking of all garbage fed to hogs in Pennsylvania after July 1, 1953, the Philadelphia Department of Streets-Sanitation became active in the control program. When too little information could be found in the literature on the effects, methods, and standards for the pressure cooking of garbage, the department decided to gather its own information so that it could intelligently advise local garbage feeders. After an evaluation of the city's two garbage reduction facilities, experiments in cooking garbage by steam pressure and open truck methods and in feeding the cooked products to hogs were started in the fall of 1953.

## Facilities at Harrowgate

Philadelphia owns two garbage reduction plants, the Harrowgate incinerator and the city reduction plant. Both plants have processed

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*Mr. Bailey is the deputy commissioner of the City of Philadelphia Department of Streets and has line direction of the sanitation division (all sanitation operations). Mr. Williamson is superintendent of the city's Harrowgate incinerator, where the experiments discussed in their report were conducted.*

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garbage over the years for its grease content, although the processing was profitable only when greases were in short supply during World War II. The two plants have a combined capacity of approximately 400 tons a day; it is not used to its fullest extent because garbage cannot be delivered on a 24-hour basis.

Rubbish is incinerated in the Harrowgate, Bartram, and Southeast incinerators, but even when these plants are operating at full capacity, they cannot handle all the rubbish in the city, much less the garbage being processed at the two reduction plants. This situation will be remedied somewhat, however, upon the completion in 1955 of a major incinerator modernization and construction program which will add 2,000 tons of daily capacity to the existing capacity of 570 tons.

It was decided to conduct the garbage cooking tests at the Harrowgate incinerator since its buildings and digester tanks were more readily adaptable to pressure cooking experiments than the facilities at the city reduction plant and since the trucks delivering the cooked garbage from the reduction unit to the cooperating farmers would interfere less with the daily operation of the plant. The Harrowgate plant could handle the additional trucks necessary and, with only slight modifications to its conveyor system, could deliver cooked garbage to the farmers' trucks by conveyor and gravity.

The Harrowgate incinerator, erected in 1923, is now being rebuilt as part of the city's incinerator expansion program. It has a reduction unit of 8 steel digester tanks and 2 hydraulic presses. This unit was added to the inciner-

**Table 1. Philadelphia experiment with garbage cooking under steam pressure at Harrowgate incinerator—3 to 5 tons of garbage cooked in each of 25 tests <sup>1</sup>**

Test No.	Steam pressure (p.s.i.g.) <sup>2</sup>	Time cooked (minutes)	Amount of water added (gallons)	Observations
1.....	50.....	8.....	100	Overcooked and unpalatable.
2.....	70.....	10.....	50	Do.
3.....	35.....	10.....	100	Partly cooked; 25 percent in solid state; too fluid.
4.....	50.....	10.....	None	80 percent cooked; insides of potatoes uncooked.
5.....	70.....	13.....	None	Well-cooked; 80 percent solids; palatable.
6.....	70.....	15.....	None	Do.
7.....	70.....	10, then 10 <sup>3</sup> .....	None	Well-cooked; 100 percent solids; palatable.
8.....	70.....	15.....	None	80 percent cooked.
9.....	70.....	15, then 5 <sup>3</sup> .....	5	Well-cooked; palatable but too fluid.
10.....	15.....	30.....	None	Well-cooked; palatable.
11.....	55.....	20.....	5	Do.
12.....	50, then 15 <sup>4</sup> .....	5, then 25.....	5	Do.
13.....	35.....	25.....	5	Do.
14.....	50, then 15 <sup>4</sup> .....	10, then 10.....	5	Do.
15.....	40.....	20.....	5	Do.
16.....	55, then 15 <sup>4</sup> .....	8, then 15.....	5	Well-cooked; 100 percent solids; palatable.
17.....	20.....	12.....	5	80 percent cooked.
18.....	50.....	7, then 25 <sup>3</sup> .....	None	Difficult to dump, but well-cooked; palatable.
19.....	35.....	25.....	5	Well-cooked; palatable.
20.....	50, then 15 <sup>4</sup> .....	10, then 21.....	None	Do.
21.....	30.....	30.....	None	Do.
22.....	35.....	15 <sup>5</sup> .....	None	Well-cooked; palatable; to facilitate dumping, 10 gal. of water added after cooking.
23.....	25.....	20, then 17 <sup>3</sup> .....	5	Well-cooked; palatable.
24.....	40.....	25.....	5	Do.
25.....	35.....	30.....	5	Do.

<sup>1</sup> Tests were run prior to obtaining instrument (equipment reference A) for measurement of temperature; however, a few temperatures were measured with a portable galvanometer.

<sup>2</sup> Pounds per square inch, gauge.

<sup>3</sup> Cooked for additional time without added steam but under pressure.

<sup>4</sup> In test 12, steam was maintained at 50 p.s.i.g. for 5 minutes, then reduced to 15 p.s.i.g. and held for 25 minutes. In the other tests noted, the pressure was reduced and maintained for the time and at the pressures indicated.

<sup>5</sup> Held until pressure went to zero.

ator in an expansion program in 1935. The tanks are lined with 2 inches of cement concrete, which has adequately withstood the corrosive effects of garbage. Only 2 tanks have had this lining patched in 18 years of service, although the hard burned brick lining in the bottom neck has permitted deterioration of the steel necks, and 7 of the 8 necks have been replaced during this period. In addition to increasing incinerator capacity, 4 additional steel digester tanks and 1 hydraulic press are being added to the reduction unit, increasing its capacity by 50 percent.

Garbage at the Harrowgate incinerator is normally processed by waste heat from the fur-

naces, the steam being produced by a 215-horsepower horizontal water tube boiler operating at 125 p.s.i.g. (pounds per square inch, gauge). The garbage is dumped from the collection truck into a pit and delivered to the digester tank by means of conveyors.

The capacity of each digester tank is from 6 to 10 tons, depending on the density of the garbage. A filled tank is cooked under a steam pressure of 70 p.s.i.g. for 2 to 4 hours to cause a breakdown of the solids. Each 4 tanks feed to a single press through a receiving box. After pressing, the juices flow from the press by gravity to a sump pump and are then pumped under pressure to storage tanks. The tankage (cake)

**Table 2. Philadelphia experiment with garbage cooking under steam pressure at Harrowgate incinerator—2 to 2½ tons of garbage cooked in each of 10 tests <sup>1</sup>**

Test No.	Steam pressure (p.s.i.g.) <sup>2</sup>	Time cooked (minutes)	Amount of water added (gallons)	Observations
26.....	15.....	65.....	None	Well-cooked; difficult to dump.
27.....	50.....	5, then 48 <sup>3</sup> .....	None	Inadequately cooked; potato green on inside.
28.....	20.....	60.....	None	Well-cooked.
29.....	35.....	41.....	None	Well-cooked; difficult to dump.
30.....	5.....	90.....	None	Well-cooked.
31.....	10.....	60.....	None	Do.
32 <sup>4</sup> .....	30, then 10.....	7, then 53.....	None	Do.
33.....	0.....	25 <sup>5</sup> .....	110	Adequately cooked, but too fluid.
34.....	10.....	20, then 40 <sup>3</sup> .....	None	Well-cooked.
35.....	15.....	45.....	None	Do.

<sup>1</sup> Tests run after obtaining instrument (equipment reference A) for measurement of temperature.

<sup>2</sup> Pounds per square inch, gauge.

<sup>3</sup> Cooked for additional time without added steam but under pressure.

<sup>4</sup> Tank preheated. After 7 minutes at 30 p.s.i.g., pressure reduced to 10 p.s.i.g. for 53 minutes.

<sup>5</sup> Open tank used for this test. After steam was cut off, material cooked in tank for an additional 35 minutes without steam.

is delivered to an incinerator furnace by means of a conveyor system. Grease in the storage tank is separated from the water by means of gravity.

A farmer living near Bristol, Pa., actively co-operated in all the pressure cooking tests by accepting the cooked garbage and feeding it to some of his hogs. The first tests at the incinerator were made with the assistance of a representative of the United States Department of Agriculture. A representative of the Pennsylvania Department of Agriculture, bureau of animal industry, was present at one of these tests and later visited the farm to observe the feeding of the cooked garbage. All tests were supervised by one of the authors.

The length of time, the amount of steam pressure, and the quantity of water added to the garbage were varied from test to test in attempting to determine the most economical and suitable method for processing garbage for feeding to hogs.

#### Pressure Cooking Method

The pressure cooking tests were conducted at the incinerator site. The superintendent of the incinerator made the necessary piping and conveyor modifications and installed a pressure reducing valve and gauges on 1 of the 8 digester

tanks at the incinerator. Cooked garbage was discharged from the bottom of this tank through a 12-inch gate valve. The other dimensions of this tank are as follows:

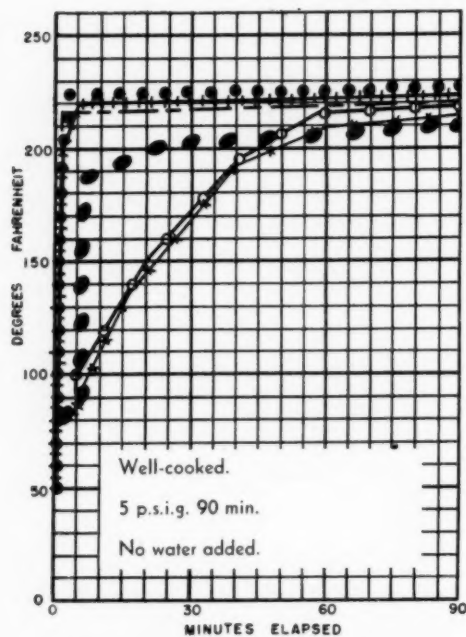
Height.....	18 ft., 11½ inches.
Inside diameter.....	6 ft.
Cement concrete lining.....	2 inches.
Steel casing.....	½ inch.
Charging port diameter.....	18 inches.
Discharge port diameter.....	12 inches.
Diameter-height ratio.....	1:3.

The first series of tests (25) was run without a complete record of temperature. However, a portable galvanometer was used for measuring temperature on some of the earlier tests. In the second series of tests (10), the temperature was measured by a temperature-recording instrument (A) with 6 recording stations at which the temperature was measured in rotation every 15 seconds. Thermocouples were spaced at 6 points throughout the digester tank. At the sixth point, the thermocouple was placed in the center of a raw potato, approximately 3 inches in diameter, to measure accurately the temperature throughout the cooking process.

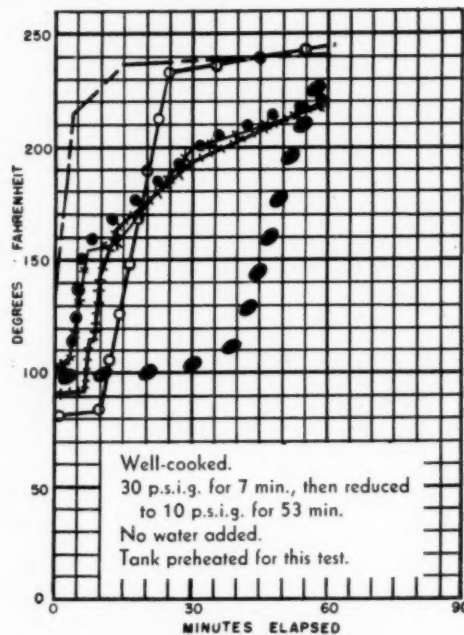
Observations made on these two series are shown in tables 1 and 2. In the first 25 tests (table 1), 3 to 5 tons of garbage were cooked in each test. In the 10 additional tests (table 2), 2 to 2½ tons of garbage were cooked in each

Figure 1. Garbage cooking tests—pressure-cooking method.

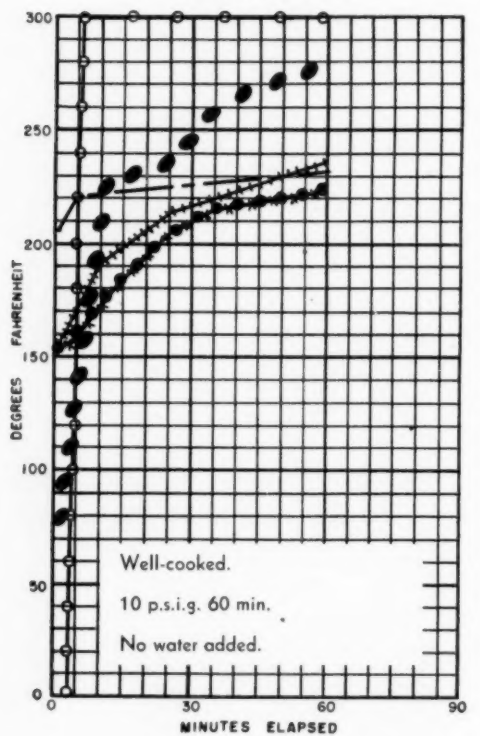
TEST  
30



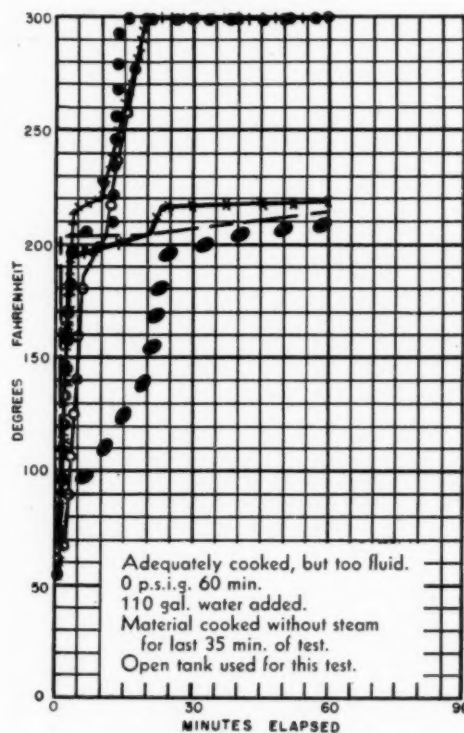
TEST  
32



TEST  
31



TEST  
33



—○—○— 54" ABOVE BOTTOM OF TANK  
—x—x—x 42" ABOVE BOTTOM OF TANK  
+++++ 30" ABOVE BOTTOM OF TANK

●●●●● 18" ABOVE BOTTOM OF TANK  
— — — 6" ABOVE BOTTOM OF TANK  
●●●● POTATO



experiment, and the thermocouples recorded the temperature at points which were 6 inches, 18 inches, 30 inches, 42 inches, and 54 inches from the bottom of the tank. All of these recording stations were located on the vertical axis of the tank. The sixth thermocouple, inside a raw potato, was located approximately in the center of the tank.

In the cooking process, we were attempting to produce a garbage which would be palatable and still not caramelized, which would require a temperature preferably below 275° F., yet one which could be maintained above 212° F. for 30 minutes to meet the specific requirements spelled out in the Pennsylvania legislation (5). Tests 30, 31, 32, and 33 produced a desirable quality in the shortest period of time. The time-temperature graphs for these tests are shown in figure 1.

The first 6 tests were run at high pressures for short periods of time. The garbage in tests 7, 9, 18, and 23 was also cooked at relatively high pressures for short periods of time. Then the steam was cut off, and the material was held under pressure but without additional steam as shown in table 1.

In tests 12, 14, 16, and 20, the loads were cooked at relatively high pressures for short

periods of time. The pressure was then reduced, and the cooking was continued for an additional time.

The technique of cooking under pressure, cutting off the steam, and holding the material in the tank under a gradually reducing pressure was also used in tests 27 and 34, while that of cooking for a short period at high pressure and then reducing the pressure and continuing the cooking with steam for an additional period was used on test 32.

Generally, we found that it was not desirable to try to shorten the cooking period by the use of high pressures. However, using relatively low pressures (5-15 p.s.i.g.) for a slightly longer period of time produced considerable savings in time and steam over open truck cooking. Figures 1-6 illustrate the savings in time. At high pressures, the length of time is critical: Overcooking caramelizes garbage, and undercooking gives inadequate temperatures.

#### Open Truck Cooking Method

When the Harrowgate incinerator was closed for rebuilding on January 7, 1954, the garbage cooking tests were continued by experimenting with open truck cooking. All of these tests were carried on outdoors. They were run at the city

**Table 3. Philadelphia experiment with garbage cooked in open truck fitted with steam pipes in truck floor—5 to 8½ tons of garbage cooked in each of 9 tests <sup>1 2</sup>**

Test No.	Line pressure (p.s.i.g.) <sup>3</sup>	Time cooked (minutes)	Amount of boiling water added (gallons)	Observations
36-----	<sup>4</sup> 50	120	None	Load not cooked; inadequate steam.
37-----	70	150	None	Load not cooked in center.
38-----	<sup>5</sup> 70	165	None	Not adequately cooked, yet caramelized on top.
39-----	75	180	None	Load not cooked in center.
40-----	<sup>6</sup> 75	180	None	Adequately cooked.
41-----	<sup>7</sup> 75	180	35	Center of load well-cooked.
42-----	<sup>8</sup> 80	160	25	Well-cooked.
43-----	80	120	30	Do.
44-----	<sup>9</sup> 80	180	25	Overcooked.

<sup>1</sup> Equipment reference A used to record temperatures.

<sup>2</sup> Truck piped for tests 36-39 in accordance with reference 6.

<sup>3</sup> Pounds per square inch, gauge.

<sup>4</sup> Steam line partly clogged.

<sup>5</sup> Load frozen solid.

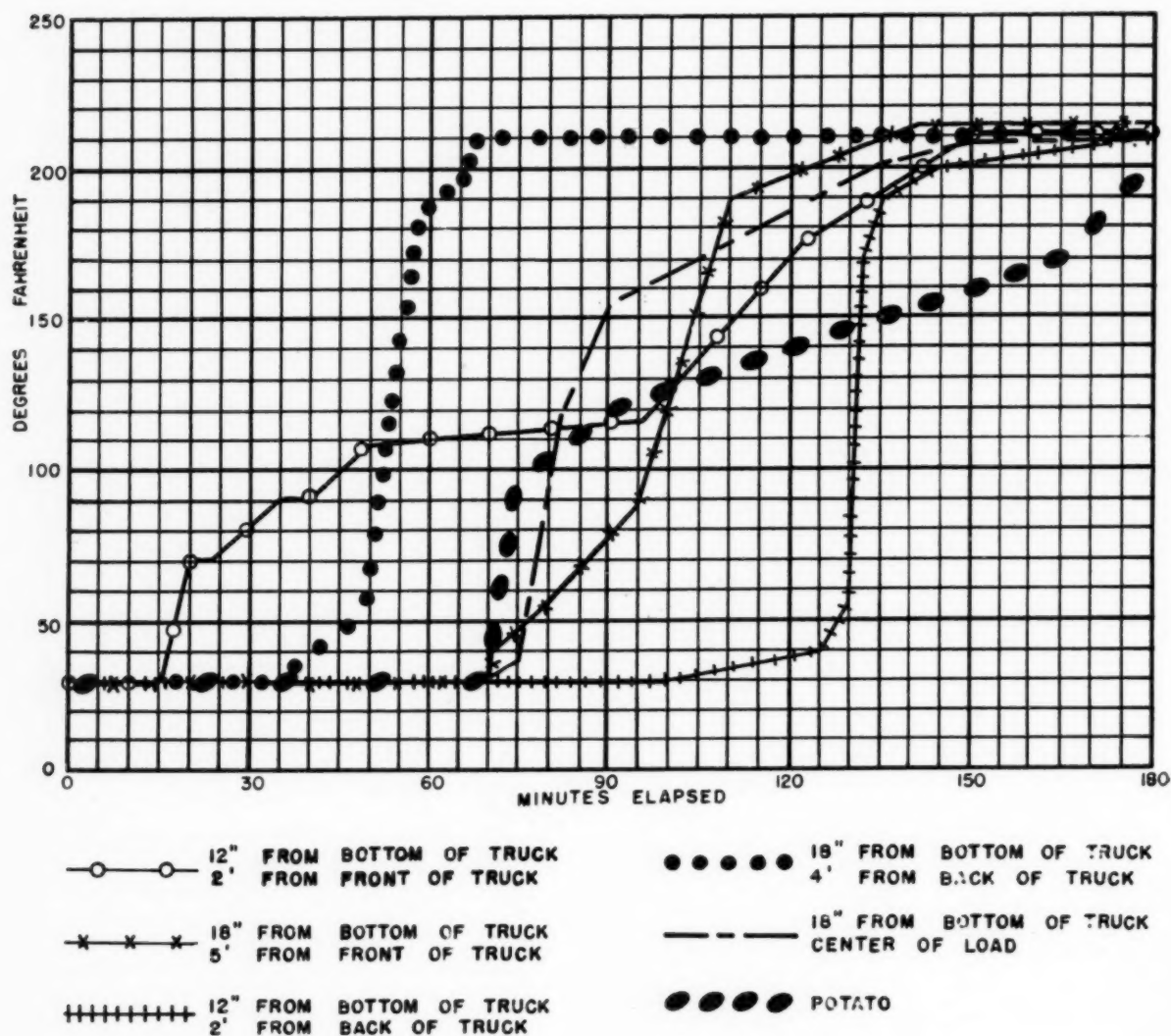
<sup>6</sup> New pipe installed above center of load with 18-inch nipples pointing down and drilled with 4 holes every 6 inches.

<sup>7</sup> Size of steam line increased from 1 inch to 1½ inches for this test and subsequent tests in this series.

<sup>8</sup> Header in truck increased from 1 inch to 1½ inches and nipples in center increased from 18 inches to 24 inches in length for this test and subsequent tests in this series.

<sup>9</sup> Each thermocouple placed in center of potato, 3 inches in diameter, most severe test of all. Additional injector nipple added in front of truck.

Figure 2. Garbage cooking test 40—open truck method. Adequately cooked. 75 p.s.i.g. 180 min. No water added. Installed new pipe in center of load with 18" nipples pointing down and drilled with 4 holes every 6".



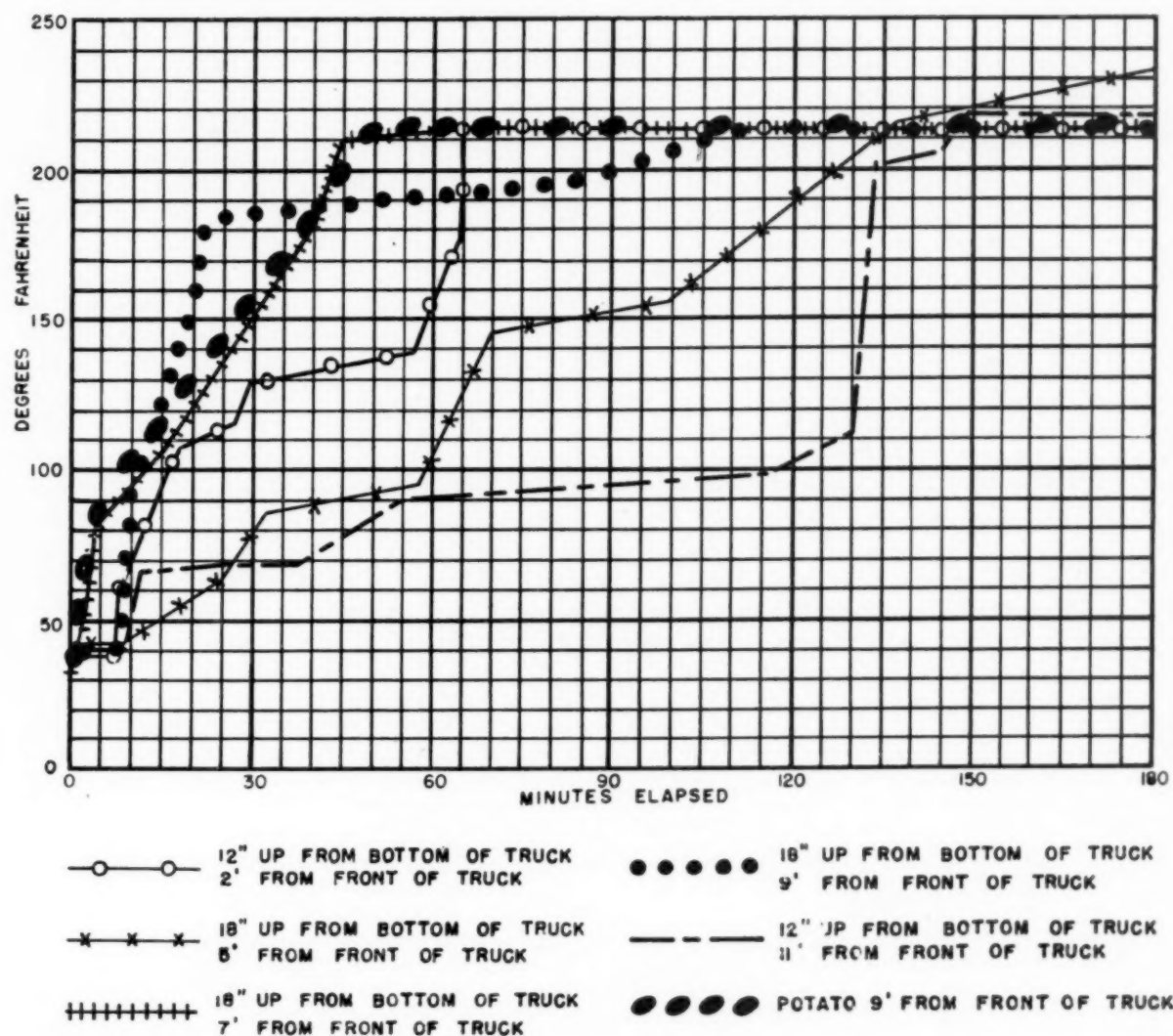
reduction plant using steam produced in 16 250-horsepower horizontal fire tube boilers, fired with fuel oil.

One of the farmer's trucks was piped for steam, and 9 tests (tests 36-44) were run (see table 3 and figs. 2-6), using steam produced by the power plant of the city reduction plant. Temperatures were measured by the same recording instrument (A) used for the second series of tests at the incinerator. The locations of the temperature-recording stations varied from test to test, and the weight of the loads varied from 5 to 8½ tons. The line pressure

was about 70 p.s.i.g. A canvas cover was tied over each load of garbage. Recommendations of the United States Department of Agriculture were followed in fitting the floor of the truck with steam pipes (6).

After running 4 tests which indicated that inadequate heat was reaching the center of the load, a 1-inch header with 5 vertical pipes, each 18 inches long and one-half inch in diameter, was installed for test 40. This header was placed on top of the load, and the 18-inch pipes were pointed down into the center of the truck. These pipes had holes drilled every 6 inches.

Figure 3. Garbage cooking test 41—open truck method. Center of load well-cooked. 75 p.s.i.g. 180 min. 35 gal. boiling water added. New pipe in center of load as in test 40. Size of steam line increased from 1" to 1½".



The lowest holes were 18 inches from the floor of the truck.

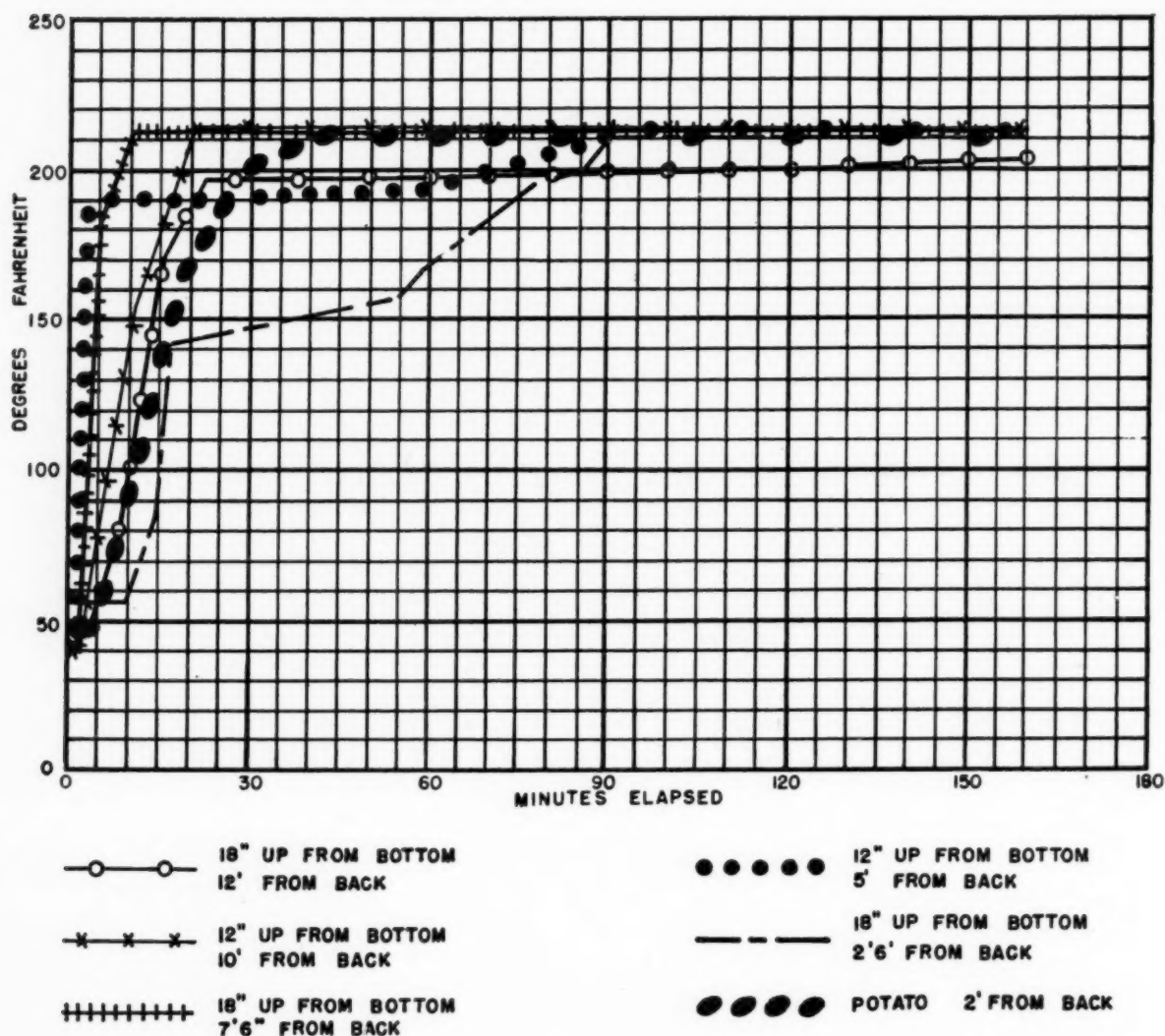
When we found that it was still taking too long to cook the garbage, the size of the steam line to the truck was increased from 1 inch to 1½ inches from the main steam header in the plant. This was done beginning with test 41. Beginning with test 42, the diameter of the header in the truck was increased from 1 inch to 1½ inches, and the length of the one-half-inch vertical pipes was increased from 18 to 24 inches. The lowest holes for the emission of steam into the center of the load were then 12 inches above the truck floor; and there were 4 holes one-

sixteenth inch in diameter at points along every 6 inches of the vertical pipes.

All 9 tests were made at freezing and below freezing garbage temperatures—the most difficult conditions to be met in the Philadelphia area. In tests 38 and 44, the garbage was frozen solid. Hot water at 190° F., which was available at a flow of 5 gallons a minute, was sprayed on top of the loads in tests 41–44. The last test (44) was the most severe of all tests because all 6 thermocouples were placed in the centers of raw potatoes approximately 3 inches in diameter, and the potatoes were distributed throughout the load.



Figure 4. Garbage cooking test 42—open truck method. Well-cooked. Material sufficiently cooked at 120 min. 80 p.s.i.g. 160 min. 25 gal. boiling water added. Same conditions as in test 41. In addition, header in truck increased from 1" to 1½". Nipples in center increased from 18" to 24" in length.



### Observations and Conclusions

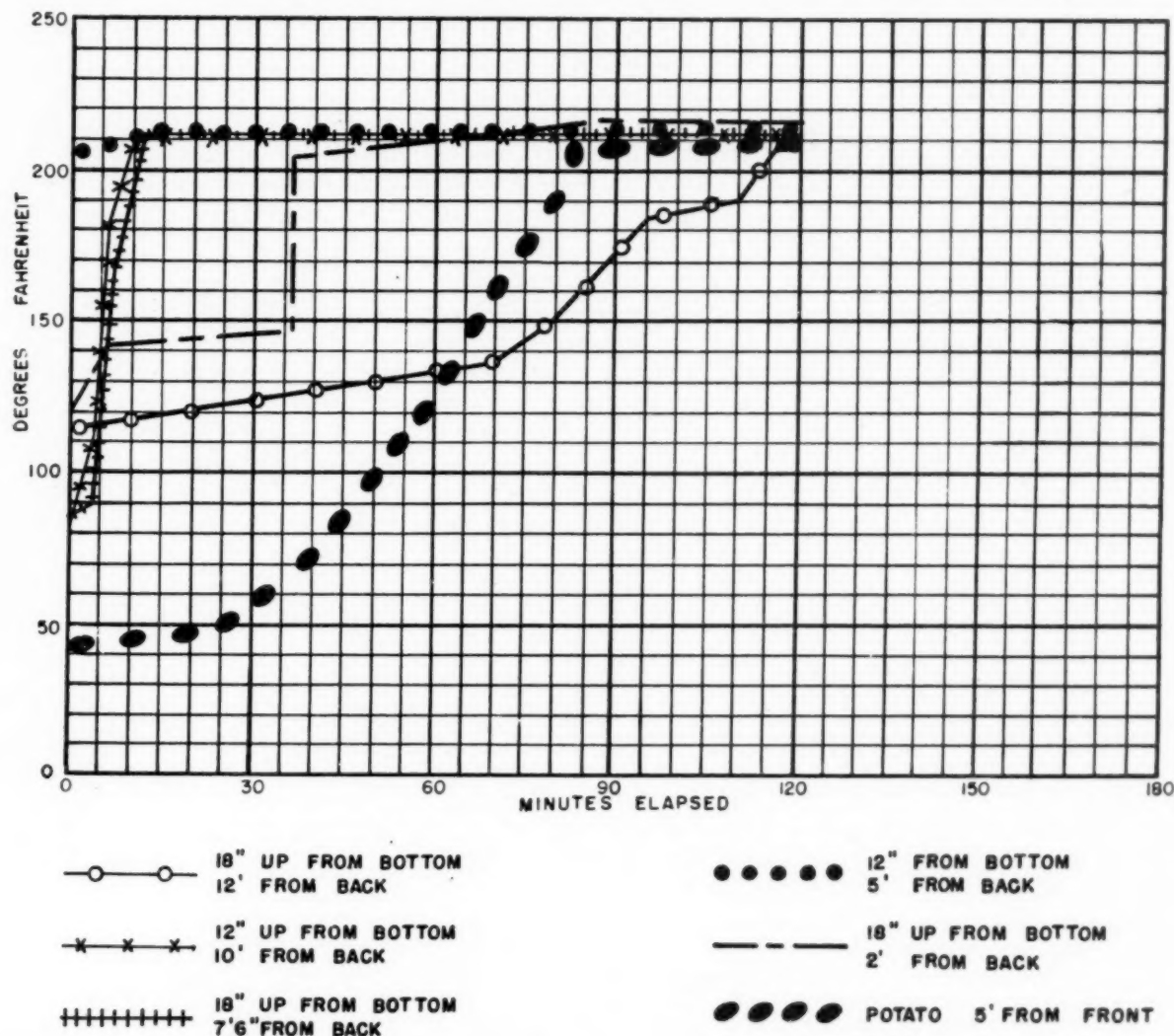
It would have been desirable to have run additional tests, but this was not possible because the farmer who was cooperating in the tests by feeding the garbage to his pigs withdrew from the experiments. He has since purchased his own boiler, however, and is prepared to cook by steam in an open truck. Also, we lacked measuring equipment to determine the amount of steam used in the different types of tests. Some of our observations are not substantiated by data because of the lack of equipment and the shortened test program.

Experience since 1935 at the Harrowgate incinerator with the use of waste heat for garbage processing has convinced us that at a very reasonable cost the city can provide high pressure steam from the heat which would normally be wasted at an incinerator. Consequently, we have made provisions at the new Northeast incinerator, construction of which is expected to begin by November 1954, for the future installation of waste heat boilers with a capacity of 90,000 pounds an hour.

One possible use of this steam in Philadelphia would be for truck cooking of garbage for



Figure 5. Garbage cooking test 43—open truck method. Well-cooked. 80 p.s.i.g. 120 min. 30 gal. boiling water added. Same conditions as in test 42.



the farmer-collector. However, to obtain the savings from the use of waste heat steam, the farmer would either have to require his laborers to stand by idle for 1½ hours, or he would need twice as many trucks for collection, so that he could leave one truck overnight at the incinerator for cooking at the same time he picks up the truckload cooked the day before.

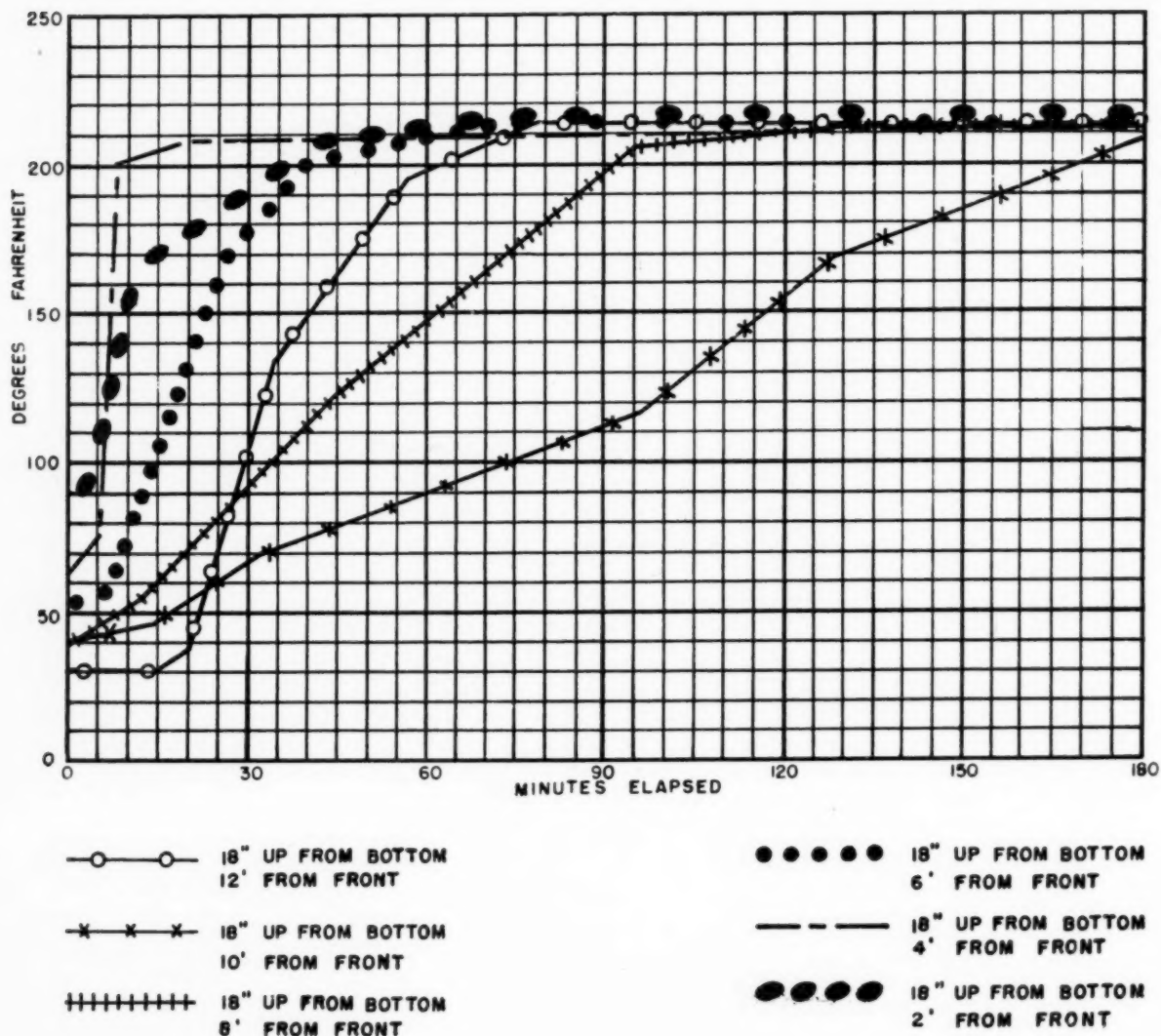
We believe that the collector would prefer to have his own steam at his own farm rather than to use the method described. According to our experience, he also would prefer the garbage he collects to that collected by others. This would eliminate cooking all garbage at the plant, then exchanging cooled cooked gar-

bage for the raw garbage the collector brings to the plant.

Although cooking garbage is certainly not an insuperable problem for the small farmer-collector, we believe that his reluctance to assume the added capital investment for purchasing equipment can best be overcome through the use of competently supervised feeding tests in which he is demonstrated the practical benefits to be derived from cooking garbage. Others have reported benefits in written reports, but the small feeder is wary of written reports (7, 8).

As a result of these experiments in Philadelphia with pressure and open truck cooking,

Figure 6. Garbage cooking test 44—open truck method. Most severe test of all. Load frozen solid. Overcooked. Material sufficiently cooked at 130 min. 80 p.s.i.g. 180 min. 25 gal. boiling water added. Conditions same as in preceding tests 42, 43. In addition, another injector nipple placed in front of truck. Each thermocouple placed in center of a raw potato 3 inches in diameter.



some observations and conclusions about their value may be helpful to health department officials and others interested in pressure cooking or in making similar tests.

#### Pressure Cooking

At high pressure, from 50 to 70 p.s.i.g., much of the garbage material is caramelized on the outside before it is thoroughly cooked on the inside. In the first 25 loads tested, a large amount of garbage was obviously unpalatable since the pigs left the burned matter on the feeding floor.

If the digester tank is brought quickly to a predetermined pressure by use of high steam pressure and the garbage is then cooked at the predetermined pressure (usually relatively low, from 5 to 15 p.s.i.g.), the product is palatable. By the time the load is dumped, the temperature approximates the recommended 30 minutes at 212° F. (5), or above, without having reached a point high enough to caramelize the garbage. Undoubtedly, all material has reached the critical point (1, 9) of 145° F. (fig. 1).

The overall time required for pressure cooking in a tank is considerably less than the time

required for cooking in an open truck. The savings in fuel, and possibly in manpower, may offset the higher cost of equipment and should be studied further by anyone interested in cooking garbage.

Agitation of the garbage being cooked plus cooking under pressure would undoubtedly reduce the time required. Also, in our opinion, all health authorities should give proper consideration to operating pressure cookers in a fixed plant having adequate instrumentation to permit a combination of time and temperature where the critical temperature of 145° F. is exceeded rather than to require a temperature of 212° F. for 30 minutes.

The pressure tanks used at the Harrowgate incinerator were not the most suitable for pressure cooking. A diameter-height ratio more nearly approximating 1:1 would have been preferable for continued operations and for ease of cleaning.

Addition of small quantities of water to the load facilitates the dumping of cooked garbage, but in processing garbage it is not necessary to add water provided the pressures are low and saturated steam is used.

Cement concrete lining such as that in the digester tanks at the Harrowgate incinerator increases the life of steel tanks substantially.

#### *Open Truck Cooking*

Although each load was covered with a tight tarpaulin, considerable steam was wasted to the atmosphere. According to our estimates, 4 to 8 times more steam is required to cook a ton of garbage in an open truck than to pressure-cook the same amount in a closed tank. The severe weather conditions outdoors at the time of the tests also affected the amount of steam required for these tests, it should be pointed out.

If the steam flow had been measured accurately, accurate costs would have been available, but the cost of cooking in open trucks seems excessive. It is estimated that garbage cooking in a large plant would cost approximately \$0.60 a ton, including depreciation,

labor, and supplies, as compared with \$0.95 a ton in open trucks, exclusive of labor.

The use of closed trucks would undoubtedly save steam and reduce odor emission to the atmosphere, an important consideration for an urban community.

The use of the header in the center of the garbage speeds the cooking time and assures temperatures of desired levels throughout the load.

Adding hot water to the garbage load reduces the time required to reach the boiling point, 212° F., by about one-half hour.

#### **EQUIPMENT REFERENCE**

- (A) Brown elektronik multipoint recorder model 153x64p6-x4IN6. Brown Instrument Division, Minneapolis-Honeywell Company, Minneapolis, Minn.

#### **REFERENCES**

- (1) Johnson, C. C., and Long, D. J.: Equipment for the heat-treatment of garbage to be used as hog feed. Washington, D. C., U. S. Department of Agriculture and the U. S. Public Health Service, 1952, 22 pp. Processed.
- (2) Kersteller, J. R., and Bugher, R. D.: Swine feeding method of garbage disposal. Chicago, American Public Works Association and the American Medical Association, 1953, 12 pp. Processed.
- (3) U. S. Public Health Service Regulations, sec. 72.23 (garbage).
- (4) Harrington, W. C.: Garbage cooking equipment. University of Massachusetts Spec. Circ. No. 10. Amherst, Mass., The University, 1953, 9 pp.
- (5) Pa. 1953, June 19, P. L. 55.
- (6) James, P., and Weaver, L.: Equipment for the heat-treatment of garbage to be used for hog feed. Supplement No. 1. Washington, D. C., U. S. Department of Agriculture and the U. S. Public Health Service, 1954, 18 pp. Processed.
- (7) Perry, C., and Schroeder, R. J.: Los Angeles County residential garbage heat-treatment and feeding trial. Los Angeles, Los Angeles Department of Sanitation, 1954, 15 pp. Mimeographed.
- (8) Van Derwerker, R. J.: Some aspects of control of trichinosis. In Proceedings of the first National Conference on Trichinosis, Chicago, The Conference, 1952, 57 pp. Mimeographed.
- (9) Wright, W. H., and Bozicevich, J.: Experiments in the cooking of garbage for the destruction of trichinae in pork scraps. Pub. Health Rep. 58: 208-220 (1943).

# The Presence Of a Pulmonary Fungus In Korean Rodents

By WILLIAM L. JELLISON, Ph.D.

*Rodents are assumed to be the reservoir of infection for hemorrhagic fever in Korea, the etiology of which remains unknown after 3 years of intensive study. A search for pathogenic agents in wild rodents led to the discovery of a pulmonary fungus, Haplosporangium. Tests so far fail to show that this organism has any relationship to the disease in man.*

INFORMATION published by the Department of the Army on epidemic hemorrhagic fever (1) and unpublished data indicate that the disease is contracted in nature and that it is rarely if ever contracted in towns or villages, nor does it appear to be contagious in the human population. As a disease in nature, an animal reservoir seems possible though not essential. A further possibility, based on rather extensive observations of others, is that rodents serve as the most likely animal reservoirs because of

their abundance and because of their close contact with human populations.

## The Survey

In view of the possibility that hemorrhagic fever might be a mycotic infection, a survey for the presence of pathogenic fungi in rodents and other small mammals in Korea was initiated by the writer during the fall of 1953. Rodents for examination were supplied by the field crews of the Field Unit, Commission on Hemorrhagic Fever, Armed Forces Epidemiological Board. Most of the collections were made from known endemic areas; however, some animals were also examined from supposedly non-endemic areas.

In this survey, 2,103 rodents and shrews were examined. Of the 1,220 specimens that were determined as to genus and for which records are available, 986 (81 percent) were *Apodemus*; 52 (4 percent), *Mus*; 30 (3 percent), *Clethrionomys*; 27 (2 percent), *Rattus*; 22 (2 percent), *Micromys*; 16 (1 percent), *Cricetulus*; 13 (1 percent), *Microtus*; and one was a *Eutamias*. This collection also included 73 (6 percent) shrews of several genera but largely *Crocidura* with a few *Sorex*.

Determinations are not available for the additional 883 small mammals examined. Their distribution in the various genera is believed to be comparable to that of those shown above.

## The Findings

Cysts of a fungus were found in the lungs of 53 separate animals or approximately 2.5 percent of all those autopsied. Infections varied from one to hundreds of cysts. Infected animals included *Apodemus agrarius*, *Apodemus peninsulae*, *Clethrionomys rufocanus*, *Cricetulus triton*, *Rattus* sp., and a single shrew of undetermined genus. A higher percentage of infection occurred in *Clethrionomys* than in other rodents. All rodents found infected came from areas presumably endemic for hemorrhagic fever.

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*Dr. Jellison, parasitologist with the National Microbiological Institute's Rocky Mountain Laboratory, Hamilton, Mont., was a member of the Field Unit, Commission on Hemorrhagic Fever, Armed Forces Epidemiological Board, when this work was carried on. Laboratory facilities of the commission's field unit at the 48th Surgical Hospital in Korea were utilized. Rodents for examination were supplied by the field crews. Airman 1st Class Jack T. Moyer, 406th Medical General Laboratory, trapped many of the animals for the study and Sgt. Rosner, 5th Epidemiological Flight, aided in their examination.*

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A total of 171 of the 2,103 rodents examined came from two presumably nonendemic areas for hemorrhagic fever. These locations were 5 miles east of Seoul and in the Seoul City water works area 6 miles east of Seoul. No rodents from these locations were found to contain pulmonary fungus cysts.

"Hill 1468" near Kapyong was considered a highly endemic focus. Three of the 17 rodents collected on this mountain peak, October 28 to 29, 1953, were found to have lung cysts. A return trip was made on November 21 to 22, 1953, and 6 of the 14 rodents trapped were infected. *Clethrionomys* was quite abundant in this area and 7 of the 25 collected were infected. Some had very numerous cysts.

The lung cysts were cultured on two types of media favorable for fungus isolations including Littman's and Sabouraud's. Littman's proved to be the more satisfactory. The cysts consistently yielded a white, cottony, sporulating mold. About 40 separate isolates were made from 10 or more separate rodents.

On the basis of cystic stage in the tissue, mycelial growth, and conidiospore formation, the fungus has been tentatively identified as *Haplosporangium* sp. by Dr. Chester Emmons and Dr. Samuel Salvin of the National Microbiological Institute, the former in the Laboratory of Infectious Diseases, Bethesda, Md., and

the latter in the Rocky Mountain Laboratory, Hamilton, Mont. It may or may not be *Haplosporangium parvum* of Emmons and Ashburn (2), the species so widely distributed in the United States and Canada. *H. parvum* is the only pathogenic species of the genus known. It has been found in many kinds of animals (3) but has not been reported for man nor has it previously been reported from Europe or Asia.

### Conclusions

Study of human cases of hemorrhagic fever, examination of autopsy material, and serological tests have so far failed to show that this organism has any relationship to the human disease.

### REFERENCES

- (1) U. S. Department of the Army: Epidemic hemorrhagic fever. Tech. Bull. TB-Med. No. 240. Washington, D. C., U. S. Government Printing Office, 1953.
- (2) Emmons, C. W., and Ashburn, L. L.: The isolation of *Haplosporangium parvum* n. sp. and *Coccidioides immitis* from wild rodents. Their relationship to coccidioidomycosis. Pub. Health Rep. 57: 1715-1727 (1942).
- (3) Jellison, W. L.: Haplomycosis in Montana rabbits, rodents, and carnivores. Pub. Health Rep. 65: 1057-1063 (1950).

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# Gonorrhea Control Measures

—A Study in New Hanover County, N. C.—

By SIDNEY S. LEE, M.D., Dr.P.H.

THE PAST DECADE has seen remarkable progress in the control of syphilis. Perhaps partly because of a lack of interest in the problem, the control of gonorrhea has not met with the same success (1-6).

## Epidemiological Considerations

Except in a few isolated local areas, there is no true measure of incidence and prevalence of gonorrhea. In the fiscal year 1952, there were 245,633 cases of gonorrhea reported to the Public Health Service by the States (7). This was more than 20 times the number of cases of primary and secondary syphilis reported for the same year. Trends in morbidity reporting of primary and secondary syphilis and gonorrhea from 1943 through 1952 for the continental United States and for North Carolina are shown in figure 1.

In many respects, the epidemiology of gonorrhea

should be simpler than that of any other communicable disease (8). The incubation period is short. Infection in the male may be suspected as soon as the urethral discharge appears, although in the female, evaluation is admittedly more difficult. There is essentially only one means of transmission, sexual intercourse. There is no intermediate host, and in most cases the source of infection should consist of only one other individual.

However, it is precisely at this last item that we may point the finger of suspicion. Effective interview of each male who seeks treatment should yield information leading to the female from whom the infection was obtained. Treatment of this female and any others exposed should be expected to result in control. On a somewhat larger scale, owing to the longer incubation period, this has been the mechanism which has led to the control of infectious syphilis.

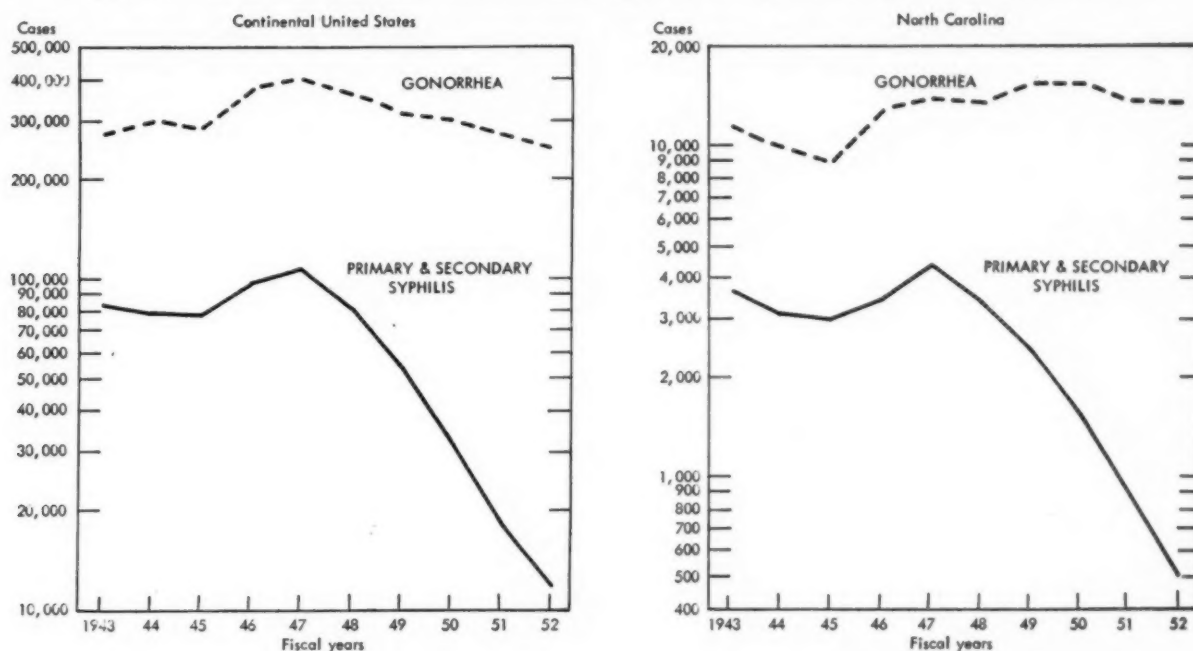
From the data in table 1, it can be seen that we have failed to find many females who are harboring this infection. If it is assumed that a theoretical ratio of one infected female per male patient exists, then merely using reported morbidity, nearly 90,000 females who have this disease went untreated in fiscal 1952. There is, admittedly, some question of the validity of the assumption that an equal number of males and females have this disease, but the relationship must be fairly close to a unitary one. This large number of untreated and presumably in-

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*Dr. Lee, assistant director of Beth Israel Hospital, Boston, Mass., since January 1954, was on assignment for the Public Health Service as venereal disease control officer for Onslow, Pender, Brunswick, Columbus, and New Hanover Counties, N. C., when this study was made. He has also served as chief of venereal disease control activities in the State department of health in Ohio and in West Virginia.*

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Figure 1. Trends of primary and secondary syphilis and gonorrhea, fiscal years 1943-52.



fectured females constitutes a sizable army capable of transmitting an infectious disease. Durel (9), who also views this group as a reservoir, has stated: "French venereologists often say that the eradication of gonorrhea depends on the treatment of gonorrhea in the female."

In fiscal 1952, 6,948 males and 5,043 females were reported in the continental United States as having primary or secondary syphilis, a ratio of 0.73 females to 1 male. As is shown above, the ratio for gonorrhea was 0.46 females to 1 male. Can this difference in ratio be a clue to the relatively slow decline of gonorrhea in the United States?

Table 1. Reported cases of gonorrhea for the continental United States, fiscal years 1948-52<sup>1</sup>

Fiscal year	Male	Female	Female/male ratio
1948-----	253, 947	109, 067	0. 43
1949-----	233, 484	98, 177	. 42
1950-----	214, 899	89, 093	. 41
1951-----	192, 515	77, 944	. 40
1952-----	167, 386	77, 834	. 46

<sup>1</sup> Data obtained from the Venereal Disease Program, Division of Special Services, Public Health Service.

Additional evidence of a possible source of failure is seen in the contact indexes for previously untreated gonorrhea, as reported by the Venereal Disease Program of the Public Health Service. For fiscal years 1950, 1951, and 1952, these indexes were 0.80, 0.83, and 0.91, respectively. If, at the very least, a single contact is not obtained from each male patient found to have gonorrhea, success cannot be achieved in controlling the disease.

#### Clinical Considerations

The diagnosis of genitourinary gonorrhea may be based upon:

1. The clinical appearance, the discharge in the male being most valuable from this standpoint.
2. A history of exposure, especially in a male patient when such exposure took place within 1 week prior to examination.
3. Examination of named contacts of the patient.
4. Gram stain of smears.
5. Culture and differentiation of organisms.
6. Complement-fixation test (rarely used).

There is no single simple test which may be performed rapidly and inexpensively to yield a definitive diagnosis. The diagnosis in the

male with a purulent discharge, a history of exposure, and a smear in which gram-negative intracellular diplococci are present, however, is relatively reliable and may be performed rapidly. Such an approach is without value for the female and is of limited usefulness for the male whose infection has become chronic. For these patients, the establishment of a definitive diagnosis is expensive and time-consuming (10-15).

Until 1943, when penicillin was added to the therapeutic armamentarium, the history of treatment of gonorrhea was largely one of sporadic hopefulness followed by failure and frustration (3, 16-19). At present, a single injection of penicillin in an absorption delaying medium is considered to produce complete cure in almost 100 percent of all cases (13), although an occasional patient may require retreatment with a higher dosage. Furthermore, there is evidence that oral penicillin taken shortly before or within a few hours after exposure will effectively prevent the development of gonorrhea (20). Some of the newer antibiotics have also been demonstrated as effective antigonococcal agents. However, penicillin remains the treatment of choice due to its ease of administration, low toxicity, high degree of effectiveness, and low cost.

Patients with gonorrhea come to diagnosis and treatment through three major case-finding measures (6, 21, 22):

1. Epidemiology or contact investigation, requiring administrative and field effort directed toward selected individuals (females).
2. Voluntary application following onset of symptoms or known or suspected exposure, requiring patient initiative and possibly motivated by "education" (males).
3. Routine physical and laboratory examinations, such as premarital, food-handler, and military, which may or may not be legally required (small numbers of both sexes).

In evaluating case-finding measures, considerable attention has been paid to the structure of the contact interview, to the kinds of contacts which should be investigated, and to the period of time which the interview should cover, but there has been surprisingly little discussion of a factor which is equally, if not more, important. This factor is the amount of time and

effort which should be devoted to locating named contacts. The elapsed time between obtaining investigative data and making a definitive diagnosis and providing treatment must be considered in dealing with a disease such as gonorrhea, which has a short incubation period. Any time lag means additional opportunity for dissemination of the infectious agent. Lack of attention to this factor may have some bearing on the apparent failure to control the disease.

### The Study Area

A decision in July 1951 that action was necessary in an extracantonment defense area in North Carolina to reduce the incidence of gonorrhea provided an opportunity for a study of how control of this disease might be effected. The area comprised five counties: Onslow, Pender, Brunswick, Columbus, and New Hanover. Control measures were applied throughout the area but most completely in New Hanover County. Data for this report are derived from the experience in that county only.

New Hanover County, the smallest county in the State, is located in the tidewater area of southeastern North Carolina on the Cape Fear River. The 1950 census indicated a population of 63,272, composed of 43,430 whites and 19,842 nonwhites. The population of Wilmington, the county seat, was 45,043. The county population increase in the intercensal period 1940-50 was 32 percent. During World War II, there was a considerable influx of population due to the location nearby of two large military establishments, Camp Lejeune and Camp Davis, and the expansion of the shipyard in Wilmington to employ 23,000 workers. The latter two of these establishments were completely inactivated at the close of the war, but Camp Lejeune was re-expanded following the onset of the Korean conflict in June 1950.

From the standpoint of desirability for this study, the geographic isolation of the area is valuable. The nearest community comparable in size to Wilmington is Fayetteville, 90 miles away. The area within a 50-mile radius, largely a rural farm section, is sparsely populated.

Counteracting the favorable geographic location, however, is the mobility of some segments



of the population (23). The Marines stationed at Camp Lejeune, 60 miles from Wilmington, constitute one large mobile group. As Wilmington is the most readily accessible large town, it is widely used as a recreational area by the troops. The visitors to the beach resorts in New Hanover County during the summer months constitute a second large group. In addition, small groups of seasonal farm and fishing labor, merchant seamen and Coast Guard personnel, construction workers, the peripatetic waitresses, and the ever-present camp followers may be counted in the mobile population.

#### *Venereal Disease Clinic*

In Wilmington, there is a well-staffed city-county health department with a long history of effective public health work. The venereal disease control program has been in more or less continuous operation since 1918, with periodic assignment of full-time venereal disease control officers on loan from the Public Health Service. Here, as elsewhere, however, the emphasis has been on syphilis control, with little attention to gonorrhea.

Prior to the start of this study the venereal disease clinic was operated daily as part of a generalized clinic which included food-handlers, marriage license applicants, and others in its caseload. Patients often were required to wait an hour or more before being seen by the physician. Diagnosis and treatment of gonorrhea were based on clinical evidence or a single smear for males and a culture for females. Little or no treatment was given on the basis of epidemiological evidence. There was little effort expended to interview gonorrhea patients or to investigate their contacts.

#### *Gonorrhea Rates*

The reported gonorrhea morbidity rates per 100,000 population for New Hanover County for 1950 and 1951 were:

	1950	1951
White.....	52	202
Nonwhite .....	4,349	6,410
Total rate.....	1,400	2,149

The striking difference in rates for the two racial groups may be attributed in part to greater utilization of clinic services by the non-white population and perhaps to somewhat less

morbidity reporting for white patients seen by private physicians. Even though these factors are taken into consideration, however, the morbidity rate for the nonwhite population is much higher than that for the white.

Cultural factors which keep the white and nonwhite groups largely separate in their sexual activity provide two distinct groups for control purposes. Because of the greater utilization of the clinic by the nonwhite population, that group is especially valuable for this study.

#### **Control Procedures**

The study was designed to test the following hypotheses: Lack of treatment of infected females is the largest single cause of failure to control gonorrhea. Interview of male patients for contacts followed by rapid investigation of exposed females and treatment of those females on epidemiological evidence only may be expected to result in a decrease in male morbidity. As the female reservoir is decreased, morbidity for both sexes may be expected to decline. Effectiveness of gonorrhea control is therefore directly related to the ability to reduce the existing female reservoir.

The study period was designated as July 1951 through June 1952, and the following procedures were adopted:

1. To achieve better patient flow and to make clinic attendance more attractive to patients, clinic facilities, including physical arrangements, personnel responsibilities, and clinical procedures, were reorganized. Special attention was paid to developing efficient and courteous relations with patients.

2. For all male patients, the diagnosis of gonorrhea was based on a history of exposure, symptoms, and clinical evidence. To validate this method of diagnosis, smears were made from 100 consecutive male patients, stained by Gram's technique, and read by two experienced technicians for presence of gram-negative intracellular diplococci. All male patients were subjected to a rapid interview to elicit sexual contacts made during a period of 3 weeks prior to onset of symptoms.

3. For female patients, a diagnosis of "epidemiological gonorrhea" was made based on information obtained from interviews. Where

clinical evidence of infection was present (for example, salpingitis, bartholinitis), a diagnosis of "clinical gonorrhea" was made. Only those females for whom a diagnosis of clinical gonorrhea was made were interviewed for sexual contacts. The interview period for those cases was established as covering 1 month prior to date of diagnosis.

4. All patients for whom a diagnosis of gonorrhea was made were interviewed for educational purposes. An attempt was made to give each patient a basic understanding of the disease for which he was treated, and he was given literature about the venereal diseases. Patients treated on epidemiological evidence only were informed that they had been exposed to the disease and that treatment was indicated as a protective measure. When the interviewer was unable to answer the patient's questions satisfactorily, the patient was referred to the physician for further explanations.

5. When information concerning contacts was adequate to warrant investigation, investigation was made the same day the information was obtained, and contacts were referred to the next daily clinic. Since rapid investigation was considered to be a key item in the study, considerable emphasis was placed on this phase of activity.

6. Efforts were made to encourage private physicians to report gonorrhea cases and to permit these patients to be interviewed for contacts. For this reason, personal visits were made to the two hospitals and to most of the private physicians in the county.

7. Public education was undertaken through group meetings, especially meetings of the parent-teacher associations. Joint meetings were held with juvenile court authorities and parents of high school students reported as venereal disease patients and contacts. These meetings were directed at alerting the parents to the problem and offering assistance in dealing with it.

8. Vigorous efforts were made to suppress prostitution and "pick-ups." Tavern owners and hotelkeepers were asked to cooperate by discouraging women from hanging around their establishments and by helping to locate contacts. Considerable support and publicity were obtained from local newspapers and civic groups.

9. Action was taken to eliminate drugstore and other unethical treatment. Cooperation of pharmacists was solicited by mail and through personal visits.

10. A daily clinic to detect venereal disease was held in the county jail. All female prisoners arrested on vice charges were offered 600,000 units of penicillin intramuscularly as a prophylactic measure. These patients were not included in reported morbidity.

11. In April and May 1952, 135 males and 60 females consecutively diagnosed as having gonorrhea were interviewed, and their clinic records were reviewed to corroborate and substantiate the interview material. Information was obtained about (a) previous infections, (b) drugstore and self-medication, and (c) duration of symptoms prior to seeking treatment.

12. Data were obtained from Camp Lejeune, including (a) gonorrhea rates and (b) contacts, with place of encounter and residence of contact.

13. The size of the investigative staff was increased from 1 to 2 persons in August 1951 and to 3 persons in December 1951. In May 1952, one of these was transferred out of the area because of a shortage of personnel elsewhere.

#### **Effect on Morbidity Among Males**

Effectiveness of the control measures can be evaluated to some extent through a review of changes in male morbidity prior to and during the study period. The number of gonorrhea cases reported for nonwhite males and females each month from January 1951 through September 1952 is shown in table 2; 6-month totals and average monthly morbidity within each 6-month period for nonwhite males is shown in table 3.

The overall decrease in morbidity for the males recorded during the study period is probably an underestimation of actual results because at the same time that efforts were being made to reduce morbidity, the following factors were operating to increase reported morbidity.

1. Increased reporting by private physicians. The morbidity data for the study period include from 3 to 5 male patients per month who were not clinic patients.

**Table 2. Reported cases of gonorrhea among nonwhite population in New Hanover County, N. C., January 1951–September 1952**

Year and month	Male	Female
<i>1951</i>		
January.....	74	20
February.....	37	8
March.....	64	7
April.....	91	18
May.....	65	17
June.....	113	26
July.....	69	63
August.....	57	62
September.....	74	52
October.....	71	54
November.....	67	59
December.....	60	44
<i>1952</i>		
January.....	50	56
February.....	40	42
March.....	51	41
April.....	52	46
May.....	56	26
June.....	55	39
July.....	79	34
August.....	61	56
September.....	63	47

2. Active measures against drugstore treatment. In July 1951, 10 percent of the patients seen in the clinic reported previous drugstore therapy; in April 1952, less than 3 percent reported such treatment. During the study period, several druggists referred patients to the clinic.

3. Improved availability of clinic services. Average daily clinic attendance doubled within 1 month after the clinic was reorganized and continued to increase slowly thereafter.

As may be seen from the data in figure 2, there was an upward trend in morbidity for the male group beginning early in 1950 and continuing until a peak was reached in April to June 1951. Expansion of Camp Lejeune undoubtedly contributed to this increase. A notable fact, however, is the absence of any marked change in female morbidity prior to July 1951. In that month, a precipitous rise occurred in morbidity reported for females as the study period began. As increasing numbers of females were brought to treatment, male morbidity declined, at first sharply, then more slowly. The decrease in male gonorrhea continued until the spring of 1952.

Unfortunately, beginning in April 1952 three

problems arose which forced relaxation of controls. The loss of one investigator and the replacement of another by a trainee resulted in a reduction in interviewing and investigative efficiency. At approximately the same time, the beach resorts opened for the season. Information relative to contacts from the beach areas proved to be particularly inadequate for investigative purposes. This was especially true at the start of the season. In June, the author was reassigned, and no replacement was available for several weeks, causing a temporary decrease in clinic services. During this period it was possible to demonstrate the effect of partial removal of controls; as seen in table 2 and figure 2, female morbidity went down and male morbidity rose.

Since treatment of females on epidemiological evidence was the cornerstone of this study, it was desirable to validate the diagnosis of the males to whom these females were exposed. If the males did not actually have gonorrhea, morbidity figures for females would be highly inaccurate. Therefore, smears were made of urethral discharges from 100 consecutive male patients for whom a diagnosis of gonorrhea was entered. Ninety-nine of these smears were read as positive for the presence of gram-negative intracellular diplococci by two technicians. The patient from whom a negative smear was obtained had taken sulfathiazole for 24 hours before attending the clinic. This would have destroyed any susceptible gonococci if they had been present. The results obtained from this sample were considered as substantiating the validity of clinical diagnosis in the male.

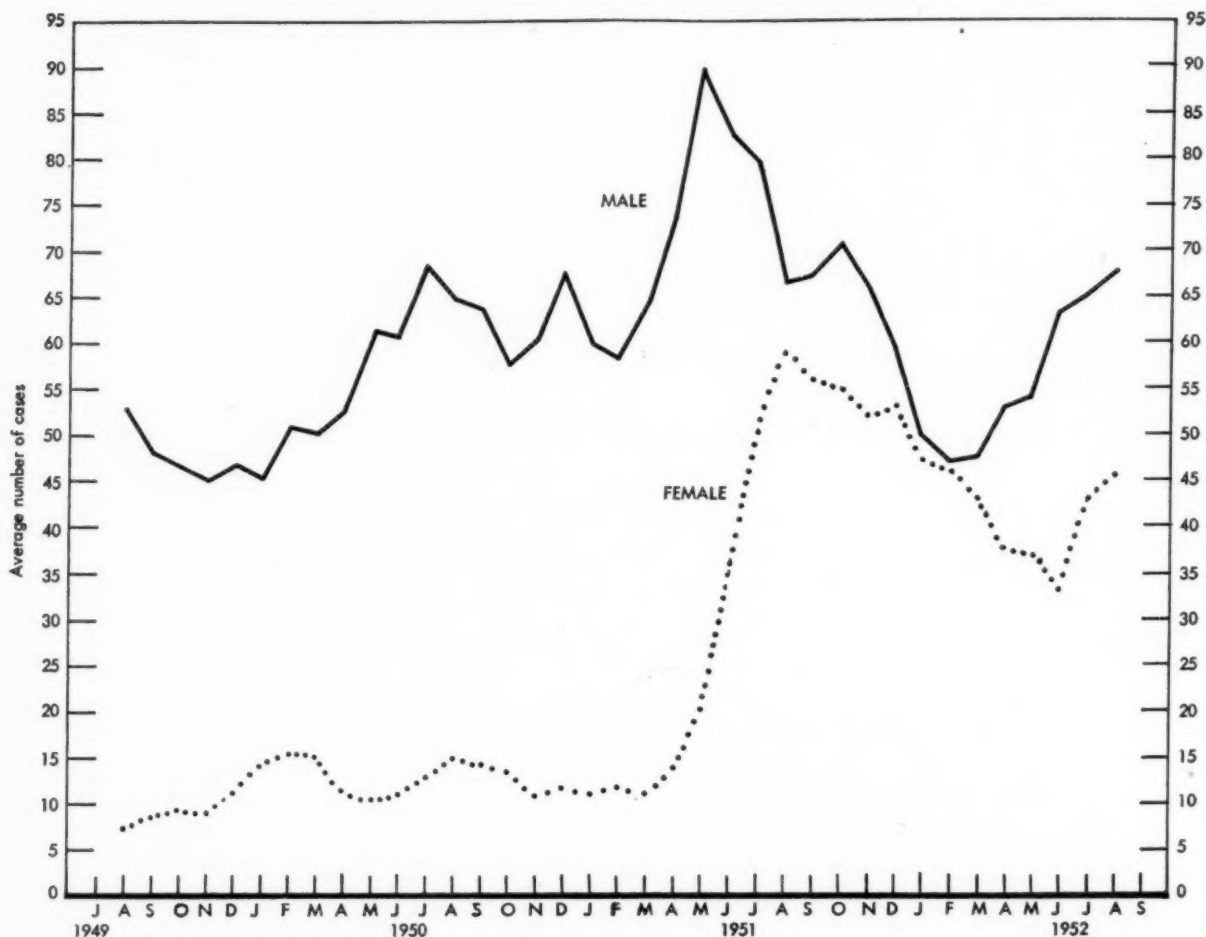
For statistical purposes, data for the 6-month period preceding the study (January through June 1951) were used as a baseline in evaluating the study period. The ratios of female to male

**Table 3. Reported cases of gonorrhea among nonwhite males in New Hanover County, N. C., January 1951–June 1952**

Date	Number of cases	Average monthly morbidity
January–June 1951.....	444	74. 0
July–December 1951.....	398	66. 3
January–June 1952.....	304	50. 7



**Figure 2. Gonorrhea morbidity among nonwhite population, centered 3-month moving average, New Hanover County, N. C., July 1949–September 1952.**



patients reported was 0.216 for the 6 months preceding the study and 0.831 for the study year. It is interesting to note that the latter is not far from the theoretical unitary relationship suggested in an earlier section.

#### Contact Information and Investigation

The number of contacts obtained and the number and percentage of these brought to treatment for the 6 months preceding the study and for the study year are shown in table 4. The contact indexes for these three 6-month periods were 1.23, 1.46, and 1.50, respectively. During the study year, a significantly higher proportion of the contacts were brought to treatment. The contact index was highest (1.55) for the 3-month period April through June 1952, but the percent brought to treatment

during this period returned to the prestudy level (64.0 percent). These figures indicate that the relaxation of control was due to inability to locate named contacts rather than to loss of interviewing efficiency or treatment failure.

As was previously noted, obtaining contacts through interview and bringing these contacts

**Table 4. Contacts of gonorrhea patients, New Hanover County, N. C., January 1951–June 1952**

Date	Number of contacts	Number brought to treatment	Percent brought to treatment
January–June 1951.....	165	103	62.4
July–December 1951.....	480	390	81.3
January–June 1952.....	346	265	76.6



to treatment through investigative activities is an inadequate control measure unless these contacts are brought to treatment rapidly. They already have had time to disseminate the disease before they are named as contacts; any delay will lead to further spread. During the study period, approximately 80 percent of all contacts eventually brought to treatment were treated within 48 hours after they were named, and more than 90 percent were treated within 5 days.

It may well be that obtaining sex contacts by interview can be more sharply limited in relation to the presumed infectious period. This will be possible, however, only if there is no significant loss of infected contacts. The 3-week period chosen for this study was an arbitrary selection. Further trial is necessary to determine if 10 or even 5 days will be adequate.

In addition, it is important to learn when a given investigation is not worth further expenditure of time. As a communicable disease comes under increasing control, the cost per case found tends to rise. Careful study is needed to determine the point where the effort required is greater than the potential value of finding the case.

In spite of the relative effectiveness of the control measures applied, the failure of the program to produce a greater decrease in gonorrhea morbidity emphasizes the need for more nearly complete reporting of morbidity and for improved interviewing and investigating techniques.

#### Morbidity Among the Military

Since the control program was in operation throughout the five-county extracantonment area, a decrease in gonorrhea morbidity in the civilian population should be expected to result in reduced morbidity among military personnel at Camp Lejeune. According to data compiled by the Public Health Service representative at the camp, shown in the tabulation below, the gonorrhea rate per 1,000 population for nonwhite troops decreased significantly. This reduction, however, can be credited only in part to the extracantonment control program, because intensive efforts to educate the troops

were being applied concurrently by military authorities.

Date	Number of cases per 1,000 population
January-June 1951-----	270
July-December 1951-----	201
January-June 1952-----	162

Another measure of the effectiveness of the control program outside the camp is reflected in military contact information. More precisely, inasmuch as New Hanover County was the area of most intensive control activity, a relative decrease in gonorrhea contacts named by military personnel as encountered or resident in that area should be anticipated. This was found to be the case, as is shown by the data in table 5.

#### Factors Hampering Control

Two of the factors which hamper efforts to control gonorrhea are the lack of immunity following infection and the failure of infected males to come to diagnosis and treatment when symptoms first appear. The data obtained in April and May 1952 from 135 consecutive male patients and 60 consecutive female patients, shown in tables 6 and 7, indicate the contribution of these two factors. Because of the presumably greater validity of history and clinical diagnosis for the male patients, discussion will be confined largely to this group.

Eighty percent of the 135 male patients had been previously infected at some time with gonorrhea, and 65 percent of the repeaters had had at least one previous infection within the pre-

**Table 5. Gonorrhea contacts named by military personnel at Camp Lejeune, N. C., January 1951-June 1952<sup>1</sup>**

Date	Number of contacts	Number of contacts in New Hanover County	Percent of contacts in New Hanover County
January-June 1951----	459	103	22.4
July-December 1951----	465	65	14.0
January-June 1952----	618	76	12.3

<sup>1</sup> Data compiled by the Public Health Service representative at Camp Lejeune, N. C.

**Table 6. History of previous infection among clinic patients, New Hanover County, N. C., April-May 1952**

Previous infection history	Male	Female	Total
Total .....	135	60	195
Previous infection .....	108	28	136
No previous infection .....	27	32	59
Previous infection during preceding year .....	70	20	90
1 episode .....	41	10	51
2 episodes .....	21	3	24
3 episodes .....	8	2	10
More than 3 episodes ..	0	5	5

**Table 7. Percentage of 135 male gonorrhea patients reporting to clinic within specified time periods following onset of symptoms, New Hanover County, N. C.**

Days	Patients previously infected (percent)	Patients not previously infected (percent)
2 or less .....	54.6	51.9
3 to 5 .....	39.8	37.0
More than 5 .....	5.6	11.1

ceding year. No significant difference was found between the percentage of male patients who had had previous infections and the percentage of those with first infections reporting to the clinic within specified time periods following onset of symptoms.

Apparently, previous infection does not exert any significant influence in inducing males to avoid infection or to seek immediate treatment. The results of this aspect of the study cast some doubt on the effectiveness of the methods used to educate the male to avoid infection or to come to treatment promptly when symptoms of infection appear. Since the patients in this group were interviewed in the spring of 1952, many of the repeaters had been exposed to educational efforts in the clinic only a few months before. It was rather disheartening to see them reappear so soon.

In addition to the data in the above tables, no significant difference was found between repeaters and first infections as to either self-medication or drugstore treatment prior to re-

porting to the clinic. The sample was very small, however.

For each male interviewed, the female contacted 3 to 6 days prior to onset of symptoms was designated as the "probable source of infection." No significant difference was found between the number of repeaters and the number of first infections who named casual pickups. Somewhat disturbing, however, was the fact that all of the eight patients who named paid prostitutes as the probable source of infection were repeaters.

It is evident that the repeater will present a continuing problem in the control of gonorrhea. However, a reduction in the size of the reservoir, such as that achieved for infectious syphilis, may be expected to result in a decrease in the number of repeaters. An adequate procedure for education of the individual patient is not yet at hand. It is hoped that further research into the field of human behavior will provide more effective tools for the accomplishment of this objective.

### Summary and Conclusions

Morbidity data for gonorrhea indicate that efforts to control this disease during the past decade have met with little success. Although there are gaps in existing knowledge concerning this disease, the failure to effect more adequate control may be attributed in part to incomplete application of present knowledge. Until more reliable tests are available for diagnosing gonorrhea in the female, the infected male must be the source of information leading to other infected individuals.

The gonorrhea control program initiated in July 1951 in New Hanover County, N. C., provided an opportunity for a year's study of the effects of rapid investigation and treatment on the basis of epidemiological evidence of female contacts named by male patients on the trend in morbidity. Until controls were relaxed in the spring of 1952, the program produced a decline in male morbidity, followed by a smaller decline in female morbidity. Failure to effect a greater decrease in morbidity emphasizes the need for increased reporting of gonorrhea cases and for improved interviewing and investigating techniques.

Important to the success of a gonorrhea control program is the cooperation of several groups, including infected persons, private physicians, pharmacists, clinic personnel, and civic groups. Their cooperation is best obtained by providing each group concerned with an understanding of the problem and of specific steps which must be taken to deal with it.

The results of interviews of 135 males concerning previous infection and duration of symptoms prior to seeking treatment indicate a need for improved educational techniques. In particular, the repeater remains a source of difficulty. Further research in the field of human behavior may result in the development of more effective techniques for dealing with the overall problem of promiscuity.

#### REFERENCES

- (1) Bauer, T. J.: The VD hunt is still on. Continued decline needs continued control. *J. Social Hyg.* 38: 290-296 (1952).
- (2) Kiesselbach, M. R.: Is gonorrhea control a public health function? *Am. J. Syph., Gonor. & Ven. Dis.* 33: 80-85 (1949).
- (3) Pelouze, P. S.: *Gonorrhea in the male and female.* Philadelphia, W. B. Saunders Co., 1941.
- (4) Pelouze, P. S.: Some unfortunate public health aspects of gonorrhea control. *M. Clin. North America* 30: 233-238 (1946).
- (5) Stephenson, C. S., and Lang, F. R.: Some epidemiologic aspects of gonorrhea in the United States Navy. *Am. J. Syph., Gonor. & Ven. Dis.* 26: 584-597 (1942).
- (6) Stephenson, C. S., Mast, G. W., and Reynolds, F. W.: Gonorrhea from the standpoint of the Navy. *Am. J. Syph., Gonor. & Ven. Dis.* 27: 393-402 (1943).
- (7) Reported cases of venereal disease in the United States, fiscal 1952 and 1953. *Pub. Health Rep.* 69: 419-421 (1954).
- (8) Nelson, N. A.: The public health control of gonorrhea. In *Proc. Conference on Venereal Disease Control Work. Supplement No. 3 to Ven. Dis. Inform.* Washington, D. C., U. S. Government Printing Office, 1936, pp. 113-124.
- (9) Durel, P.: Current methods in the treatment of venereal diseases in France. *Brit. J. Ven. Dis.* 27: 75-91 (1951).
- (10) Clark, E. G.: Contagious diseases spread by contact [gonorrhea]. In *Rosenau preventive medicine and hygiene* by K. F. Maxcy. Ed. 7. New York, N. Y., Appleton-Century-Crofts, 1951, pp. 276-279.
- (11) Johnston, J.: Nongonococcal Neisserian strains isolated from the genitourinary tract. *Am. J. Syph., Gonor. & Ven. Dis.* 35: 79-82 (1951).
- (12) Kiesselbach, M. R.: The use of culture tests in the diagnosis of gonorrhea. *J. Ven. Dis. Inform.* 29: 329-331 (1948).
- (13) Parkhurst, G. E., Harb, F. W., and Cannefax, G. R.: "Penicillin-resistant gonorrhea" vs. "nonspecific urethritis." *J. Ven. Dis. Inform.* 28: 211-214 (1947).
- (14) Van Slyke, C. J., Thayer, J. D., and Mahoney, J. F.: Comparison of media and laboratory results in gonococcus cultures. *Am. J. Syph., Gonor. & Ven. Dis.* 26: 55-62 (1942).
- (15) Wilkinson, A. E.: Occurrence of *Neisseria* other than the gonococcus in the genital tract. *Brit. J. Ven. Dis.* 28: 24-27 (1952).
- (16) Boak, R. A., Charles, R. L., and Carpenter, C. M.: Tolerance of the gonococcus in vitro for increasing concentrations of sulfanilamide. *Tr. Am. Neisserian M. Soc.* 5: 118-119 (1939).
- (17) Pelouze, P. S.: Gonorrhea: The epidemic we face. *Ven. Dis. Inform.* 25: 75-80 (1944).
- (18) Vonderlehr, R. A.: Renaissance of the gonorrhea control program. *Am. J. Syph., Gonor. & Ven. Dis.* 27: 411-414 (1943).
- (19) Vonderlehr, R. A., and Heller, J. R., Jr.: The control of venereal disease. New York, Reynal and Hitchcock, 1946.
- (20) Eagle, H., Gude, A. V., Beckmann, G. E., Mast, G., Sapero, J. J., and Shindledecker, J. B.: Prevention of gonorrhea with penicillin tablets. Preliminary report. *Pub. Health Rep.* 63: 1411-1415 (1948).
- (21) Wright, J. J., and Sheps, C. G.: Reports of the North Carolina syphilis studies. III. An evaluation of case-finding measures in the control of gonorrhea. *J. Ven. Dis. Inform.* 30: 211-217 (1949).
- (22) Guthrie, N. W.: Contact investigation in gonorrhea. *Am. J. Syph., Gonor. & Ven. Dis.* 28: 571-582 (1944).
- (23) Lee, S. S.: Military plus civilian equals control. VD control in a military area. *J. Social Hyg.* 38: 363-370 (1952).

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## Mental Health Clinic Statistics

**A**PPROXIMATELY 60 persons from 28 States, the Veterans Administration, and the National Institute of Mental Health participated in the First Conference on Mental Health Clinic Statistics held at Bethesda, Md., April 21-22, 1954.

The conference was sponsored by the National Institute of Mental Health, National Institutes of Health, Public Health Service. Present were psychiatrists, clinical psychologists, psychiatric social workers, and statisticians who participate in the administration and operation of outpatient psychiatric clinic programs on a State, local, and national level.

Opening speakers emphasized the importance of developing uniform data on the preventive mental health program. Such data are needed in planning for clinic facilities, determining staffing patterns, developing training programs, and evaluating services offered to patients and to various groups and agencies in the community. These data are needed also to inform legislative and other supporting bodies regarding the clinics' activities and their costs. It was pointed out also that the recent National Governors' Conference on Mental Health (Detroit, Mich., February 8-9, 1954) listed the adoption of uniform terminology for statistical reporting procedures in the field of mental health as 1 of 10 objectives for a State mental health program.

### Review of a Uniform Report Form

One of the principal purposes of the First Conference on Mental Health Clinic Statistics

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*Prepared by the Outpatient Reports and Record Unit, Biometrics Branch, National Institute of Mental Health, National Institutes of Health, Public Health Service, Bethesda, Md.*

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was to obtain the assistance of the States represented in the preparation of the final draft of a proposed annual statistical report of outpatient psychiatric clinics, which was initiated for nationwide use on July 1, 1954. This report form is the result of 2 years' exploratory work by the National Institute of Mental Health with the cooperation of State Mental Health Authorities and allied professional organizations in developing uniform units of count and definitions for obtaining basic information on mental health clinic activities throughout the country. The report form will provide data on number and location of outpatient psychiatric clinics, clinic auspices, professional staff and man-hours, and source of funds; number, age and sex of patients served, amount and type of service received by patients, psychiatric disorders found, and results of treatment; amount of professional time spent in community-oriented services, such as public mental health education, inservice mental health training of professional groups, and consultation services to other community agencies.

Based upon the trial experience of 22 States in the use of this report form, the conferees made certain modifications in the definitions used to achieve further clarity in their interpretation. Of primary importance is the definition of a "psychiatric outpatient clinic," since it determines the "universe" from which data are sought. For the purpose of statistical reporting to the National Institute of Mental Health, the conferees agreed that a psychiatric outpatient clinic is "a psychiatric outpatient service for ambulatory patients, where a psychiatrist is in attendance at regularly scheduled hours and takes the medical responsibility for all of the patients in the clinic. Clinics that have only a psychiatrist on call or as a consultant are not included."

It was emphasized that in a psychiatric out-



patient clinic, although the psychiatrist may not see all patients attending the clinic, he assumes medical responsibility for diagnosis, treatment, and other psychiatric services given to all patients. Clinics are therefore differentiated from family service agencies which may employ psychiatrists for consultation regarding specific cases and, in some instances, examination or treatment where indicated. Likewise, clinics are different from counseling centers operated by clinical psychologists with the assistance of some psychiatric consultation. It was suggested that family agencies and counseling centers should not be considered "clinics," a term which usually refers to medical agencies.

As a practical first step in developing a statistical program, national tabulations based on the annual statistical report will be limited to clinics as defined. Other centers which provide mental health services can, however, report to State agencies. There was a suggestion that national reporting plans be expanded as soon as possible to include such centers in order to obtain a complete picture of mental health services in the country.

Also reviewed were definitions of patient, diagnosis, treatment, group psychotherapy, person-interview, followup interview, and termination of service. On the whole, the definitions used in the trial run were found to be satisfactory, and only minor revisions were made. A committee on definitions was designated to assist the National Institute of Mental Health in the continued review of the definitions, based on experience with the report form on a nationwide scale. Another committee was designated to study and make appropriate recommendations regarding criteria and classifications for reporting condition of patient (improvement or unimprovement) on termination after treatment.

There was general agreement that data supplied on the annual statistical report regarding consultative services to agencies, educational and other community-directed activities of clinics are of value. These data will indicate how much clinic time goes into such service, the kind of community services provided and to whom they are provided, and determination of possible areas where such services may be lacking. Although the national report form

requests information on community activities for 1 month only, a number of States plan to collect these data throughout the year.

### Diagnostic Classifications

The conference also reviewed trial experience with the annual statistical report in the reporting of diagnostic classifications, adopted from the revised (1952) Diagnostic and Statistical Manual of Mental Disorders prepared by the American Psychiatric Association (1). The use of standard nomenclature in psychiatry has not kept pace with its usage in other diseases. (See foreword to the Diagnostic and Statistical Manual of Mental Disorders.) This has been particularly true in psychiatric outpatient clinics, as compared with mental hospitals. Instead of standard terms, many clinics have used descriptive sentences or paragraphs to describe the patient. Such records, however, do not lend themselves to comparable and discrete classification required for tabulation and analysis of disorders found.

The publication of the revised (1952) Diagnostic and Statistical Manual of Mental Disorders, as part of the fourth edition of the Standard Nomenclature of Diseases and Operations (2), and simultaneously the inclusion of these standard terms in the national clinic report have given wide impetus to clinic recording and reporting of diagnostic classifications. It is to be expected that numerous problems of a general and technical nature would arise from this sudden transition.

Comments were made at the conference with regard to the strong and weak points of the diagnostic classifications, as well as with regard to the principle of "recording a diagnostic label," particularly for children. It was emphasized by several participants that the Diagnostic and Statistical Manual is a help in sharpening clinic thinking on a patient. The ability to use the manual properly, however, depends on its thorough study and understanding.

Because of problems encountered, a committee on reporting of diagnostic classifications was designated to receive and summarize comments on the statistical use of the manual and to prepare appropriate reports to the conference and to the Committee on Nomenclature

and Statistics of the American Psychiatric Association.

In the discussion of diagnostic classifications, a request was made for additional or alternative "axes" of patient classification, such as referral symptoms or problems, social diagnosis, and so forth. No standard classifications, however, have been developed in these areas although a number of States are attempting to collect these data. Eventually, it may be possible to collect such information nationally to supplement the medical psychiatric classification.

#### **Procedures for Effective Reporting**

The procedures for collecting data reported in the annual statistical report were reviewed at the conference. To assist in the compilation of patient data, many States will provide mechanical tabulating services to both State-aided and non-State-supported clinics. This service will tend to assure complete, uniform, and accurate reporting and will facilitate State and clinic analyses of the data.

In order to integrate the reported information in program review and administration, reports from all clinics in a State, with few exceptions, will be forwarded to the State Mental Health Authority, and then to the mental health consultant in the Public Health Service regional office. The reports will then be transmitted to the Biometrics and Community Service Branches of the National Institute of Mental Health for tabulation and information and for other purposes. The Veterans Administration will attempt to develop comparable information for its clinics so that State and nationwide totals of clinic activities can be obtained.

The conferees emphasized the need to prepare and distribute summaries and published reports to reporting clinics as promptly as possible. The Institute staff reviewed the preliminary plans they have developed to accomplish this. Responsibility for distribution, collection, and followup and review for accuracy will be delegated to the State Mental Health Authority and Public Health Service regional offices where there is familiarity with the details of clinic operations. At the National Institute of Mental Health, data will be processed in such fashion that many useful cross-tabula-

tions can be easily prepared and special statistical requests can be quickly and efficiently met. As an example, punchcards with names and addresses of all clinics in the country have been prepared, thus making it possible to provide, on request, the names and addresses of clinics with specified characteristics. These punchcards will also provide up-to-date listings of clinics for the interim periods between publication of clinic directories.

The annual statistical report will provide a nucleus of uniform basic data for nationwide comparisons. In a number of States, these data will be supplemented by additional information routinely collected on patients, such as referral source, referral problem or complaint, race, reason for termination, and disposition. The committee on definitions will review the experience of the States in collecting these data from the standpoint of usefulness of the information and practicality of collection. It will recommend standard definitions and classifications of items, where desirable, for the use of States interested in collecting these data and to permit interstate comparisons.

A committee on tabulations was also set up to recommend, for the use of interested States, additional cross-tabulations of items included in the annual statistical report and to suggest model charts and graphs for presentation of clinic data to clinic boards, the community, and so forth.

#### **Evaluation and Other Research Studies**

There was time for only a brief discussion on special studies engaged in by a number of States and clinics. Nevertheless, the observation was made by a number of conferees that a principal obstacle to sound evaluation studies is the widely held belief that the primary function of a clinic is to prevent hospitalization for mental disorder. They pointed out, however, that clinics serve as a case-finding and screening medium. The recommendation of hospitalization where needed, and early enough to be effective, is a clinic function. It was emphasized that clinics perform a variety of important functions. Perhaps the points of view expressed at the conference are best summarized in the following statement:

"To evaluate clinics on the basis of the number of people that are kept out of hospitals is a very small part of the story of the value of the clinic. The clinic may help some people earn money who wouldn't be able to earn money. It may keep some people out of delinquent activity who would be delinquent. There are many, many ways in which a clinic serves a social function, but it is hard to measure. To measure it on one criterion, and that is the number of people kept out of hospitals, is some kind of fallacy."

In addition to committees concerned with the continued improvement of the annual statistical report, three committees were designated to develop pilot techniques for statistical and research studies. These committees will, respectively:

1. Study and suggest techniques for conducting detailed statistical studies designed to show how clinic staff time is utilized and the costs of these activities. Demonstrate how such studies can assist in the administrative management of mental health clinics.

2. Develop research studies designed to find out, through followup of the patient after close of the case, whether treatment has been effective, whether clinic recommendations have been carried out, and so forth.

3. Study the need for other types of statistical studies and research which could be undertaken on a cooperative basis by a number of States or on a sample of clinics and make appropriate recommendations. Such study might include collecting additional information on

specific kinds of patients or on a sample of all patients or collecting additional information with regard to certain aspects of community service activities.

Through these multidiscipline committees, persons from different States with different ideas, experience, and professional skills will be brought together to work on various problems. It is hoped that future conferences on mental health clinic statistics will provide the framework for carrying out, on a cooperative basis among interested States, special studies which these committees may suggest. Thus, we may look forward to the possibility of many useful projects which, through coordinated efforts among the States, will add to the core of uniform clinic data soon to be collected and will advance the clinic statistical and research program on many fronts.

. . .

*Copies of the uniform clinic report form and definitions may be obtained from the Biometrics Branch, National Institute of Mental Health, National Institutes of Health, Public Health Service, Bethesda 14, Md.*

#### REFERENCES

- (1) American Psychiatric Association. Mental Hospital Service: Diagnostic and statistical manual, mental disorders. Washington, D. C., The Association, 1952.
- (2) Standard nomenclature of diseases and operations. Ed. 4. Published for the American Medical Association. New York, Blakiston, 1952.

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# The Bethesda-Ballerup Group Of Paracolon Bacteria

The Bethesda-Ballerup group of bacteria was formed by combining the Bethesda group of Edwards, West, and Bruner (1948) and the Ballerup group of Bruner, Edwards, and Hopson (1949). The latter group is typified by the culture described as *Salmonella ballerup* by Kauffmann and Moeller (1940). The two groups were combined because there were no consistent differences in their biochemical reactions and, as the study progressed, it was found that a marked community of O and H antigens existed between the two. Strains previously classified in the Bethesda group were agglutinated by serums derived from type cultures of the Ballerup group, and vice versa. Both groups could be classified among the organisms referred to as *Paracolobactrum intermedium* of Borman, Stuart, and Wheeler (1944) and both belonged to the more strictly defined type 14011 of Stuart, Wheeler, Rustigian, and Zimmerman (1943).

Upon isolation mediums and in preliminary biochemical tests the Bethesda-Ballerup strains resembled *Salmonella* and produced confusion in diagnosis. Further, they were found frequently in the stools of persons affected with diarrhea and gastroenteritis and were thought by some workers to be capable of causing those conditions. Thus the organisms not only complicated the diagnosis of salmonellosis, but possibly played some role in the causation of enteric infection. It was to facilitate the recognition of the bacteria and to provide a means whereby their role in enteric infections could be assessed that the work was undertaken.

A total of 506 cultures was included in the study. The bacteria were derived almost entirely from the intestinal tracts or stools of

man and the lower animals. Many cultures were isolated from persons with enteric infection but others were from normal individuals. The cultures of animal origin were largely from normal dogs, cats, monkeys, and other animals,



## Public Health MONOGRAPH

### No. 22

This article is a summary of the principal findings presented in Public Health Monograph No. 22, published concurrently with this issue of Public Health Reports. The authors are bacteriologists at the Enteric Bacteriology Laboratory, Communicable Disease Center, Public Health Service, Atlanta, Ga.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch, Public Health Service. Copies will be found also in the libraries of professional schools and the major universities, and in selected public libraries.

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West, Mary G., and Edwards, Philip R.: The Bethesda-Ballerup Group of Paracolon Bacilli. Public Health Monograph No. 22 (Public Health Service Publication No. 362). U. S. Government Printing Office, Washington, D. C., 1954. Price 30 cents.



and fowl. All of the cultures produced  $H_2S$ , were methyl red positive, Voges-Proskauer negative, failed to produce indol, utilized Simmons' citrate and D-tartrate, and failed to hydrolyze urea. All fermented glucose promptly, usually with the production of gas. None utilized adonitol nor liquefied gelatin. Fermentation of lactose, sucrose, and salicin was variable. Fermentation of these substances usually was delayed and often was negative.

Serologic examination of the organisms revealed that they composed a closely integrated group with interlocking O and H antigens and that relationships existing between and among the strains were numerous and complex. In spite of these complex relationships, it was possible to establish 32 O groups which included 35 O types. The H antigens were more diverse, and 88 H antigens which occurred in 75 combinations were recognized. On the basis of these O and H antigens a schema which included 167 serologic types was established. Among cultures of the Bethesda-Ballerup group received for diagnosis, 95 percent could be assigned to the above-mentioned O groups and both the O and H antigens of 85 percent of such cultures could be recognized.

Once the antigenic limits of the group had been established, the production of polyvalent serums for screening procedures was investigated. This problem was complicated by certain O antigen relationships to the *Salmonella* group. In spite of this difficulty polyvalent screening serums were produced which, when

used in conjunction with polyvalent *Salmonella* serum, were a distinct aid in diagnosis.

The Bethesda-Ballerup group of paracolon bacilli possessed biochemical characteristics similar to the indol negative strains usually classified as *Escherichia freundii*. The only difference between the latter species and the Bethesda-Ballerup group was that *E. freundii* fermented lactose rapidly, whereas the paracolon bacteria fermented lactose slowly. Therefore, the diagnostic serums prepared for the classification of the paracolon bacteria were used to examine 79 typical cultures of *E. freundii*, most of which were isolated from soil, water, and stools. Using the Bethesda-Ballerup antiserums, either the O or H antigens, or both the O and H antigens of 70 percent of the cultures could be recognized. It was noted that speed of lactose fermentation was not correlated with serologic properties since both slow and rapid lactose fermenters were found in the same serologic types.

From these results it seems likely that the Bethesda-Ballerup group actually is a part of a larger *E. freundii* group. No definite conclusions could be drawn regarding the role of the organisms in enteric infection. However, since serologic types were established and means provided for the recognition of identical strains, henceforward it will be possible better to assess the significance of the bacteria in the production of disease. In addition, methods were established for the production of screening serums which were a distinct aid in the recognition of the group.

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# technical publications

## Health Manpower Source Book

### County Data From 1950 Census and Areas Analysis.

*Public Health Service Publication No. 263, section 4. 1954. By Maryland Y. Pennell and Marion E. Altenderfer. 247 pages; tables and maps. \$1.75.*

### Industry and Occupation Data From 1950 Census, by State.

*Public Health Service Publication No. 263, section 5. 1954. By Marion E. Altenderfer and Maryland Y. Pennell. 215 pages; tables. \$1.50.*

Special tabulations from the 1950 Census of Population are the basis of the information in sections 4 and 5 which conclude the health manpower source book series. Data are presented on the following 18 health occupations which are treated as specific categories: chiropractors, dentists, dietitians and nutritionists, professional nurses, student professional nurses, optometrists, osteopaths, pharmacists, physicians and surgeons, psychologists, medical and dental technicians, veterinarians, attendants in physicians' and dentists' offices, attendants in hospitals and other institutions, opticians and lens grinders and polishers, midwives, practical nurses, and therapists and healers not elsewhere classified (including chiropodists, occupational therapists, physical therapists, and certain other health personnel).

Section 4 presents information on the number of employed persons in the health occupations of individual counties and data on population, hospital beds, and selected socioeconomic factors. Because of the interdependence of counties in the utilization of health resources, the data are presented for several different geographic aggregates which can be evaluated as health service areas. The text gives an analysis of health

facilities and personnel resources in these groups of counties.

In section 5 a set of tables shows the characteristics of workers in each health occupation, for the 4 regions and for the 48 States and the District of Columbia. This publication also includes material on the occupation, class of worker, and sex of persons in the two health service industries—hospitals and health services excluding hospitals. Details are provided about occupations within the health service industries for the United States and on major occupation groups within the health service industries for regions and States.

## Nursing Aide Instructor's Guide

*Public Health Service Publication No. 342. 1953. 26 pages; illustrated. 25 cents.*

This guide was prepared by the Division of Nursing Resources to help nurses in hospitals who are called on to teach nursing aides. It is designed for instructors who use the illustrated "Handbook for Nursing Aides in Hospitals" as their text.

The booklet suggests ways the teacher may expand and adapt the handbook material to fit the individual hospital's policies and practices, and tells how to organize a planned program of instruction. The flexible teaching method recommended allows the instructor full freedom to use her own ideas and imagination in training nursing aides.

The guide is part of a nationwide training project in which the Public Health Service, the American Hospital Association, and the National League for Nursing have collaborated. The Division of Nursing Resources staff wrote the basic handbook, the American Hospital Association published it in Chicago, and

the league is carrying on institutes to teach the training method.

The American Hospital Association has purchased stocks of the guide from the Superintendent of Documents and supplies one copy free of charge to each hospital placing a bulk order for the handbook. Bulk orders of the guide should be placed with the Superintendent of Documents, U. S. Government Printing Office.

## Nurses

*Public Health Service Publication No. 345. 1954. 16 pages. 15 cents.*

This booklet discusses the opportunities a nurse has to set in motion proper procedures for dealing with the emotional problems of her patients and their families. It tells of the nurse's potential ability to be a major influence in building sound mental health among people. It suggests that the nurse can apply to her work the principle common to both nursing and mental health care: satisfying human needs.

The booklet explains that because a nurse works directly with people and because she frequently is called upon to help at critical periods in their lives, she needs knowledge and understanding of human behavior and the ability to apply these to best advantage.

There is also in the booklet a list of source material, including films and radio program transcriptions, with information on availability.

## Training and Research Opportunities Under the National Mental Health Act

*Public Health Service Publication No. 22. Mental Health Series No. 2. Revised 1954. 15 pages. 10 cents.*

This pamphlet describes the opportunities available under the National Mental Health Act of 1946 for support of training leading to a career in one of the mental health disciplines or for training as a re-

# technical publications

search investigator in the field of mental health. It also describes the National Institute of Mental Health's research grants program which provides funds for the support of fundamental, applied, and developmental research in the field of mental health. Eligibility requirements and procedures for applying for traineeships, research fellowships, and research grants are outlined.

The program for support of research and training in the field of mental health is administered by the National Institute of Mental Health—1 of the 7 National Institutes of Health of the Public Health Service.

## Rehabilitation Centers In the United States

*By Henry Redkey. Published and distributed by the National Society for Crippled Children and Adults, Chicago, Ill. 1953. 128 pages; illustrated. Reprinted by the Office of Vocational Rehabilitation, U. S. Department of Health, Education, and Welfare, 1954.*

This publication is a compilation of information submitted by 40 rehabilitation centers for the First National Conference on Rehabilitation Centers, December 1-3, 1952, under the sponsorship of the National Society for Crippled Children and Adults and the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare.

The material is intended to be useful as a guide to help those persons wishing to provide up-to-date facilities for the disabled in their communities, as well as a reference for those already engaged in the operation of rehabilitation centers.

With the exception of one center which serves only the tuberculous, this survey is limited to those centers serving several disability groups.

The centers have been divided into 6 classes: teaching and research centers, centers operated by hospitals and medical schools, community centers with beds, community outpatient centers, insurance centers, and vocational rehabilitation centers.

## Health Abroad: A Challenge to Americans

### Iran: One of Many

*Public Health Service Publication No. 349. 1954. 13 pages; illustrated.*

This pamphlet describes the Foreign Operations Administration's health program in Iran, as a representative sample of such programs in 39 countries throughout the underdeveloped areas of the world. The story of Iran embodies most of the characteristics of the United States overseas missions and of the activities carried on by United States health workers abroad. In Iran are seen all of the contrasts in health knowledge, attitude, and conditions that American workers are encountering in their battle against disease in many parts of the globe.

Through the Division of International Health, the Public Health Service now recruits and assigns staff to the United States Operations Missions, provides technical and program support and evaluation, and operates a fellowship program for trainees sent to this country by United States Operations Missions, the World Health Organization, and foreign governments.

The missions are comprised of physicians, sanitary engineers, sanitarians, nurses, malarialogists, health educators, and other specialists in the various disciplines of public health and sanitation.

Because of the expanding program and replacement of personnel completing the prescribed 2 years of

duty, there is a continuous need for all types of qualified public health personnel in this important program. This pamphlet includes information on how to join the overseas health program.

## Public Health Service Research Grants and Fellowships, 1953

*Public Health Publication No. 339. 1954. 55 pages. 25 cents.*

The Public Health Service research grants and fellowships program, administered by the Division of Research Grants of the National Institutes of Health, is intended to increase the research potential and accelerate the research effort throughout the United States. Research assistance of approximately \$23 million was granted for the fiscal year of 1953 and covered investigations in the full range of medical and related biological studies. The awards were made in support of individuals in training or research in 301 institutions located in 44 States and several foreign countries.

This pamphlet lists the recipients of the 2,084 research grants and the 543 research fellowships alphabetically by State or country and by institution. The amount of the award and the subject of study are given. A brief description of the processing of applications is included.

## Statistical Summary of Water Supply and Treatment Practices in The United States

*Public Health Service Publication No. 301. 1953. By John R. Thoman. 53 pages; tables. 20 cents.*

Based on the 1948 Inventory of Water and Sewage Facilities (unpublished), this report analyzes, discusses, and summarizes data on public water supply and treatment facilities in the United States. Supplemental statistical data from various sources have been used in the



# technical publications

comparisons and development of trends.

The summary is considered a valuable tabulation of basic data on American water supplies. The detailed information was collected from sanitary engineering divisions of the State health departments, covering data of incorporated communities of over 100 population and unincorporated communities of over 500 population. Data furnished include estimated population served, ownership, source of supply, rated capacity and average daily output, type of laboratory control, and distribution system storage.

This is one of a continuing series of reports issued by the Public Health Service concerning water and sewerage practices in the United States. The most important of these are: Inventory of Water and Sewage Facilities in the United States, 1945 (published in 1948); Statistical Summary of Sewage Works in the United States, Public Health Reports Supplement No. 213 (April 1950); Water Pollution in the United States, Public Health Service Publication No. 64 (1951); Public Sewage Treatment Plant Construction, 1952, Public Health Service Publication No. 291; Public Sewage Treatment Plant Construction, 1953 (in preparation).

## Management of Venereal Diseases

*Public Health Service Publication No. 327. 1953. 14 pages.*

Designed for physicians, nurses, students in professional schools, medical societies, and allied professional groups, this pamphlet contains in brief form the latest information available as of September 1, 1953, on the treatment and re-treatment of venereal diseases. Schedules for treatment of primary and secondary syphilis are based upon experience of the Therapy Evaluation Unit of the Venereal Disease Program, Public

Health Service. The schedules for treatment of other stages of syphilis and other venereal diseases are based upon the experience of various workers and have been used satisfactorily by the treatment centers of the program.

Besides syphilis, the pamphlet contains information on the management of gonorrhea, nonspecific urethritis, saprophytic spirochetal balanitis, chancroid, granuloma inguinale, and lymphogranuloma venereum.

State health departments, as well as the Public Health Service, will supply single copies or limited quantities upon request.

## A Comprehensive Program for Water Pollution Control for the Mississippi-Des Moines-Skunk Rivers Basin

*Water Pollution Series No. 55. Public Health Service Publication No. 314. 1953. 35 pages; appendices; tables. Available from the State water pollution control agencies of Iowa, Illinois, Minnesota, and Missouri and the Mississippi-Des Moines-Skunk Rivers Basin Office.*

This document is one of a series presenting comprehensive pollution abatement programs developed by the States and adopted by the Surgeon General of the Public Health Service in accordance with the Water Pollution Control Act.

This report contains the comprehensive water pollution control program for the Mississippi-Des Moines-Skunk Rivers Basin developed by the Iowa State Department of Health, Illinois Sanitary Water Board, Minnesota State Department of Health, and the Missouri Division of Health. Additional sewage treatment plant construction is recommended, as well as expansion of some of the existing facilities. In-

tensification of State water pollution control educational programs is also urged.

The Mississippi-Des Moines-Skunk Rivers Basin is composed of portions of the States of Iowa, Illinois, Minnesota, and Missouri, with the largest part lying in central Iowa. The basin comprises a part of one of the most productive agricultural areas in the United States. From this region comes a large part of the Nation's hogs and cattle. Production of farm grains and dairy products, as well as industrial production, meat packing and associated products are also of economic importance in the area.

The waters of the streams are utilized for numerous purposes, including municipal water supply, industrial water supply, waste disposal, development of power, livestock watering, recreation, game fishing, and fish and wildlife propagation. There are 134 population centers in the basin served by sewage systems having a connected population of over 547,000. Of these centers, 29 provide no treatment for their wastes; 60 existing municipal sewage treatment plants have an inadequate capacity. The total organic wastes still being discharged into the streams, including those from industries not connected to municipal sewers, are equivalent to the wastes of a population 35 percent larger than the actual population reported.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.